

# EXHIBIT H

Doc Code: PA..  
Document Description: Power of Attorney

PTO/AIA/82B (07-13)  
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## POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 78905
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

**Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:**

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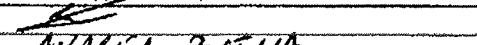
I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

**CHIARO TECHNOLOGY LIMITED**

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

### SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	18 JULY 2018
Name	ADRIANA ZITNA		
Title	CHIEF REVENUE OFFICER		

**NOTE:** Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)**

<b>Title of Invention</b>	BREAST PUMP SYSTEM		
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to: <input type="checkbox"/> The attached application, or</p> <p><input checked="" type="checkbox"/> United States application or PCT international application number <u>16/009,547</u></p> <p>filed on <u>15 June 2018</u></p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.</p> <p style="text-align: center;"><b>WARNING:</b></p> <p>Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.</p>			
<b>LEGAL NAME OF INVENTOR</b>			
Inventor: <u>Jonathan O'TOOLE</u>		Date (Optional): _____	
Signature: _____			
<p><b>Note:</b> An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.</p>			

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)**

<b>Title of Invention</b>	<b>BREAST PUMP SYSTEM</b>
-------------------------------	---------------------------

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or

☒ United States application or PCT international application number 16/009,547  
filed on 15 June 2018

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

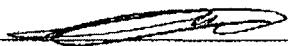
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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**LEGAL NAME OF INVENTOR**

Inventor: Adam ROLLO Date (Optional): \_\_\_\_\_

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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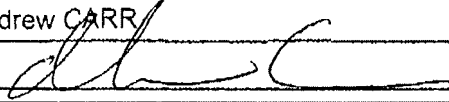
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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)**

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<b>LEGAL NAME OF INVENTOR</b>	
Inventor: <u>Andrew CARR</u> Date (Optional): _____	
Signature: <u></u>	
<p>Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.</p>	

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**PATENT**

**Docket No. 373499.00049**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

INVENTORS: **Jonathan O'TOOLE et al.**  
APPLICATION NO. **TBD**  
FILED: **Herewith**  
CASE NO. **373499.00049**  
TITLE: **BREAST PUMP SYSTEM**

Confirmation No.

Examiner:  
Group Art Unit:

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**FILED ELECTRONICALLY ON February 22, 2021**

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**SUBMISSION OF INFORMATION DISCLOSURE  
STATEMENT UNDER 37 CFR §§1.97 AND 1.98**

Sir:

Submitted herewith for the above-identified application is an Information Disclosure Statement under 37 CFR §§1.97 and 1.98. Pursuant to 37 CFR §1.98(d)(1), Applicant has not provided copies of the foreign patent and non-patent literature cited in the accompanying Information Disclosure Statement ("IDS"), since copies of these publications were submitted in IDS's filed on June 15, 2018; December 7, 2018; or November 3, 2020, in parent Application No. 16/009,547, of which the present application is a continuation.

The Examiner is requested to initial a copy of the enclosed Form PTO-1449 and return a copy to applicant.

Respectfully submitted

February 22, 2021

Date

/Mark D. Simpson/

Mark D. Simpson, Esquire  
Registration No. 32,942

SAUL EWING ARNSTEIN & LEHR LLP  
Centre Square West  
1500 Market Street, 38<sup>th</sup> Floor  
Philadelphia, PA 19102-2189  
Telephone: 215 972 7880  
Email: Mark.Simpson@saul.com

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Jonathan O'Toole	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	373499.00049	

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	2849881	A	1958-09-02	ANDERSON	
	2	4390024	A	1983-06-28	WILLIAMS	
	3	4535627	A	1985-08-20	PROST, et al.	
	4	5474683	A	1995-12-12	BRYANT, et al.	
	5	5941847	A	1999-08-24	HUBER, et al.	
	6	5973770	A	1999-10-26	CARTER, et al.	
	7	6045529	A	2000-04-04	NUEESCH	
	8	6090065	A	2000-07-18	GILES	

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

9	6227936	B1	2001-05-08	MENDOZA	
10	6328709	B1	2001-12-11	HUNG, et al.	
11	6358226	B1	2002-03-19	RYAN	
12	6383163	B1	2002-05-07	KELLY, et al.	
13	6440100	B1	2002-08-27	PRENTISS	
14	6461324	B1	2002-10-08	SCHLENSOG	
15	6547756	B1	2003-04-15	GRETER, et al.	
16	6579258	B1	2003-06-17	ATKIN, et al.	
17	6663587	B2	2003-12-16	SILVER, et al.	
18	6749582	B2	2004-06-15	BRITTO, et al.	
19	7048519	B2	2006-05-23	FONG, et al.	

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20	7201735	B2	2007-04-10	ATKIN, et al.	
21	D548831	S	2007-08-14	CHARLEZ	
22	7312554	B2	2007-12-25	VOGELEY	
23	7314400	B2	2008-01-01	FILDAN, et al.	
24	7662018	B1	2010-02-16	THOMPSON	
25	7776008	B2	2010-08-17	RENZ, et al.	
26	8057425	B1	2011-11-15	MYERS, et al.	
27	8118772	B2	2012-02-21	DAO, et al.	
28	8187227	B2	2012-05-29	LUZBETAK, et al.	
29	8262606	B2	2012-09-11	GRETER, et al.	
30	8282596	B2	2012-10-09	GRETER, et al.	

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Application Number		
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31	8376986	B2	2013-02-19	VAN, et al.
32	8702646	B2	2014-04-22	GARBEZ, et al.
33	8801495	B1	2014-08-12	GUINDON
34	8876760	B2	2014-11-04	BOSMAN, et al.
35	8926556	B2	2015-01-06	VAN EIJKELNBORG, et al.
36	9033913	B2	2015-05-19	KHALIL, et al.
37	9173587	B2	2015-11-03	VAN SCHIJNDEL, et al.
38	9345274	B1	2016-05-24	PRILL
39	9539377	B2	2017-01-10	MAKOWER, et al.
40	10039871	B2	2018-08-07	POLLEN, et al.

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Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20020193731	A1	2002-12-19	MYERS, et al.	
	2	20040056641	A1	2004-03-25	MYERS, et al.	
	3	20040074281	A1	2004-04-22	LOBDELL, et al.	
	4	20040267215	A1	2004-12-30	CHARLEZ, et al.	
	5	20050219302	A1	2005-10-06	VOGELEY, et al.	
	6	20060122575	A1	2006-06-08	WAKABAYASHI	
	7	20070051172	A1	2007-03-08	PERINET, et al.	
	8	20070051727	A1	2007-03-08	HOLLEY	
	9	20080177224	A1	2008-07-24	KELLY, et al.	
	10	20080262420	A1	2008-10-23	DAO, et al.	

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11	20080275386	A1	2008-11-06	MYERS	
12	20110004154	A1	2011-01-06	VAN, et al.	
13	20110196291	A1	2011-08-11	VISCHER, et al.	
14	20110274566	A1	2011-11-10	AMIROUCHE, et al.	
15	20120277636	A1	2012-11-01	BLONDHEIM, et al.	
16	20130023821	A1	2013-01-24	KHALIL, et al.	
17	20140031744	A1	2014-01-30	CHEN	
18	20140052056	A1	2014-02-20	GARBEZ, et al.	
19	20140275857	A1	2014-09-18	TOTH, et al.	
20	20140323962	A1	2014-10-30	KOOIJKER, et al.	
21	20140378895	A1	2014-12-25	BARACK	

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22	20150217036	A1	2015-08-06	POLLEN, et al.	
23	20150217037	A1	2015-08-06	POLLEN, et al.	
24	20150283311	A1	2015-10-08	ALVAREZ, et al.	
25	20160000980	A1	2016-01-07	ALVAREZ, et al.	
26	20160058928	A1	2016-03-03	NOWROOZI, et al.	
27	20160058929	A1	2016-03-03	MEDVEDEV, et al.	
28	20160082165	A1	2016-03-24	ALVAREZ, et al.	
29	20160082166	A1	2016-03-24	GUTHRIE, et al.	
30	20160151551	A1	2016-06-02	FELBER	
31	20160158424	A1	2016-06-09	CHEN, et al.	
32	20160166745	A1	2016-06-16	AALDERS	

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33	20160206794	A1	2016-07-21	MAKOWER, et al.	
34	20160220743	A1	2016-08-04	GUTHRIE, et al.	
35	20160220745	A1	2016-08-04	GUTHRIE, et al.	
36	20160256617	A1	2016-09-08	HANSEN	
37	20160287767	A1	2016-10-06	SIMMONS, et al.	
38	20160296681	A1	2016-10-13	GASKIN, et al.	
39	20160310650	A1	2016-10-27	MAKOWER, et al.	
40	20170021068	A1	2017-01-26	GASKIN, et al.	
41	20170035951	A1	2017-02-09	TANAKA	
42	20170043065	A1	2017-02-16	TAKEUCHI	
43	20170072117	A1	2017-03-16	KURIHARA, et al.	

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44	20170072118	A1	2017-03-16	MAKOWER, et al.	
45	20170143879	A1	2017-05-25	OKAGUCHI	
46	20170220753	A1	2017-08-03	GUTHRIE, et al.	
47	20180021490	A1	2018-01-25	CHANG, et al.	
48	20180110906	A1	2018-04-26	BARACK	

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	1	3311982	DE	C2	1983-10-13	BATTELLE MEMORIAL INSTITUTE		
	2	9503280	EP	A2	1992-02-08	PIERBURG GMBH		
	3	9420158	WO	A1	1994-09-15	DEKA PRODUCTS LIMITED PARTNERSHIP		
	4	19750620	DE	A1	1999-06-02	SIEMENS AG, 80333 MUENCHEN, DE		

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First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

5	1586340	EP	A2	2005-10-19	SEA PROFIT (HONG KONG) LIMITED		
6	2005114116	WO	A1	2005-12-01	LANE, JOHN, DENNIS; ESPARZA, JOSEPH, LUIS; NICHOLS		
7	2005114113	WO	A3	2006-03-02	ACCU-GAUGE LIMITED		
8	1430918	EP	B1	2008-05-14	MEDELA HOLDING AG		
9	2344380	RU	C1	2009-01-20	GOSUDARSTVENNOE OBRAZOVATEL'NOE UCHREZHDENIE VYSSH		
10	2009134271	WO	A1	2009-11-05	UTC POWER CORPORATION		
11	2473022	GB	B	2011-12-14			
12	2441367	RU	C2	2012-02-10	OBSHCHESTVO S OGRANICHENNOJ OTVETSTVENNOST'JU 'NAU		
13	2436277	EP	A1	2012-04-04	DREW, LORNA		
14	2210628	EP	B1	2013-02-13	MEDELA HOLDING AG		
15	2499248	GB	B	2014-04-02	ELIZABETH MORANA		

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

16	1404393	EP	B1	2014-12-24	MEDELA HOLDING AG		
17	2015081459	WO	A1	2015-06-11	CHEN, JUNBO		
18	2015116749	WO	A1	2015-08-06	CORNING INCORPORATED		
19	2015120321	WO	A1	2015-08-13	NAIA HEALTH, INC.		
20	2015150225	WO	A1	2015-10-08	KONINKLIJKE PHILIPS N.V.		
21	2015174330	WO	A1	2015-11-19	MURATA MANUFACTURING CO., LTD.		
22	2016002606	WO	A1	2016-01-07	MURATA MANUFACTURING CO., LTD.		
23	2016006494	WO	A1	2016-01-14	MURATA MANUFACTURING CO., LTD.		
24	2016006496	WO	A1	2016-01-14	MURATA MANUFACTURING CO., LTD.		
25	2016007560	WO	A1	2016-01-14	NAYA HEALTH, INC.		
26	2016010524	JP	A	2016-01-21	MURATA MFG CO LTD		

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

27	2016014469	WO	A1	2016-01-28	EXPLORAMED NC7, LLC		
28	2016014488	WO	A1	2016-01-28	EXPLORAMED NC7, LLC		
29	105288759	CN	A	2016-02-03	SHANGHAI NORMAL UNIVERSITY		
30	2016024558	WO	A1	2016-02-18	MURATA MANUFACTURING CO., LTD.		
31	2016039083	WO	A1	2016-03-17	MURATA MANUFACTURING CO., LTD.		
32	2016104673	WO	A1	2016-06-30	MURATA MANUFACTURING CO., LTD.		
33	2077868	EP	B1	2016-07-27	MEDELA HOLDING AG		
34	2016164853	WO	A1	2016-10-13	NAYA HEALTH, INC.		
35	1263487	EP	B2	2016-11-23	MEDELA HOLDING AG		
36	2017061349	WO	A1	2017-04-13	MURATA MANUFACTURING CO., LTD.		
37	2017108555	WO	A1	2017-06-29	KONINKLIJKE PHILIPS N.V.		



# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

	38	2017139480	WO	A1	2017-08-17	EXPLORAMED NC7, INC.	
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If you wish to add additional Foreign Patent Document citation information please click the Add button

Add

## NON-PATENT LITERATURE DOCUMENTS

Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	Whisper Wear Hands-Free Breast Pump, Model: WWMP01, User Guide, pps. 1-20, Distributed with product at least as early as 2007 (see <a href="https://web.archive.org/web/20070621162539/http://www.whisperwear.com/pump_single.html">https://web.archive.org/web/20070621162539/http://www.whisperwear.com/pump_single.html</a> )	

If you wish to add additional non-patent literature document citation information please click the Add button

Add

## EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
Art Unit		
Examiner Name		
Attorney Docket Number	373499.00049	

## CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark D. Simpson/	Date (YYYY-MM-DD)	2021-02-22
Name/Print	Mark D Simpson	Registration Number	32942

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>				
<b>Filing Date:</b>				
<b>Title of Invention:</b>	BREAST PUMP SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE			
<b>Filer:</b>	Mark D. Simpson/Lynn White			
<b>Attorney Docket Number:</b>	373499.00049			
Filed as Small Entity				
<b>Filing Fees for Utility under 35 USC 111(a)</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	80	80
UTILITY SEARCH FEE	2111	1	350	350
UTILITY EXAMINATION FEE	2311	1	400	400
<b>Pages:</b>				
UTILITY APPL SIZE FEE PER 50 SHEETS >100	2081	1	210	210
<b>Claims:</b>				
CLAIMS IN EXCESS OF 20	2202	10	50	500
<b>Miscellaneous-Filing:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1540

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	41980268
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	78905
<b>Filer:</b>	Mark D. Simpson/Lynn White
<b>Filer Authorized By:</b>	Mark D. Simpson
<b>Attorney Docket Number:</b>	373499.00049
<b>Receipt Date:</b>	22-FEB-2021
<b>Filing Date:</b>	
<b>Time Stamp:</b>	11:50:41
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1540
RAM confirmation Number	E20212LB51264897
Deposit Account	504364
Authorized User	Lynn White

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

## File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	38100216_1.PDF	1840898	no	9
			e18d5b636885ae687cdded5ad7ebb66abe bb9982		
Warnings:					
Information:					
2		38102084_1.PDF	439142	yes	127
			2b118aabea10baabd2f13e20ff86170a6c16 a544		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		127	127	
	Claims		122	126	
	Specification		1	121	
Warnings:					
Information:					
3	Drawings-other than black and white line drawings	38100202_1.PDF	7248994	no	44
			dd8a02bde993a389fd699c5d98244e20a84 d91cd		
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
4		38100214_1.PDF	236689	yes	4
			25e4ff64342b479b953e8a937054b7c94bfc a5f4		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	

	Power of Attorney	4	4
	Oath or Declaration filed	1	3

**Warnings:****Information:**

5	Transmittal Letter	38102041_1.PDF	95914	no	1
			ebd8d3ceb20517464b70d30cf34916230cd9a65		

**Warnings:****Information:**

6	Information Disclosure Statement (IDS) Form (SB08)	38100228_1.PDF	1043546	no	15
			c571836125d6d166fa356539884d73323480d172		

**Warnings:****Information:**

7	Fee Worksheet (SB06)	fee-info.pdf	38319	no	2
			fc50b9ebe01f7e6d704f97e531e411f95b06881d		

**Warnings:****Information:**

<b>Total Files Size (in bytes):</b>		10943502
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**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**



Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	373499.00049
		Application Number	
Title of Invention	BREAST PUMP SYSTEM		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

## Secrecy Order 37 CFR 5.2:

<input type="checkbox"/> Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--

## Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Jonathan		O'TOOLE			
Residence Information (Select One)    US Residency    •    Non US Residency    Active US Military Service						
City	London	Country of Residence <sup>i</sup>		GB		
Mailing Address of Inventor:						
Address 1		c/o Chiaro Technology Limited				
Address 2		63-66 Hatton Garden				
City	London	State/Province				
Postal Code	EC1N 8LE	Country i	GB			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Adam		ROLLO			
Residence Information (Select One)    US Residency    •    Non US Residency    Active US Military Service						
City	London	Country of Residence <sup>i</sup>		GB		
Mailing Address of Inventor:						
Address 1		c/o Chiaro Technology Limited				
Address 2		63-66 Hatton Garden				
City	London	State/Province				
Postal Code	EC1N 8LE	Country i	GB			
Inventor	3				Remove	
Legal Name						

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	373499.00049
		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Andrew		CARR	
Residence Information (Select One)    US Residency <input checked="" type="radio"/> Non US Residency    Active US Military Service				
City	London	Country of Residence <sup>i</sup>	GB	

**Mailing Address of Inventor:**

Address 1	c/o Chiaro Technology Limited			
Address 2	63-66 Hatton Garden			
City	London	State/Province		
Postal Code	EC1N 8LE	Country <sup>i</sup>	GB	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button. <span>Add</span>				

**Correspondence Information:**

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
<input type="checkbox"/> An Address is being provided for the correspondence Information of this application.			
Customer Number	78905		
Email Address	patents@saul.com	<span>Add Email</span>	<span>Remove Email</span>

**Application Information:**

Title of the Invention	BREAST PUMP SYSTEM		
Attorney Docket Number	373499.00049	Small Entity Status Claimed	<input checked="" type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	44	Suggested Figure for Publication (if any)	1

**Filing By Reference:**

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country <sup>i</sup>

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	373499.00049
		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

**Publication Information:**

<input type="checkbox"/>	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
<input type="checkbox"/>	<b>Request Not to Publish.</b> I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application <b>has not and will not</b> be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

**Representative Information:**

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:			
<input checked="" type="radio"/>	Customer Number	<input type="radio"/>	Limited Recognition (37 CFR 11.9)
Customer Number	78905		

**Domestic Benefit/National Stage Information:**

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	<div></div>	<div>Remove</div>	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of <div></div>	16009547	2018-06-15
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button.			<div>Add</div>

**Foreign Priority Information:**

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)<sup>1</sup> the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	373499.00049
		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

Application Number	Country <sup>i</sup>	Filing Date (YYYY-MM-DD)	Access Code <sup>j</sup> (if applicable)	<a href="#">Remove</a>
1709561.3	GB	2017-06-15	1DE1	
Application Number	Country <sup>i</sup>	Filing Date (YYYY-MM-DD)	Access Code <sup>j</sup> (if applicable)	<a href="#">Remove</a>
1709564.7	GB	2017-06-15	B3B5	
Application Number	Country <sup>i</sup>	Filing Date (YYYY-MM-DD)	Access Code <sup>j</sup> (if applicable)	<a href="#">Remove</a>
1709566.2	GB	2017-06-15	D6F6	
Application Number	Country <sup>i</sup>	Filing Date (YYYY-MM-DD)	Access Code <sup>j</sup> (if applicable)	<a href="#">Remove</a>
1809036.5	GB	2018-06-01	D82C	
Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button.				<a href="#">Add</a>

## Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

<input type="checkbox"/> This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
---

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	373499.00049
		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

## Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

**NOTE:** This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

### 1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

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		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

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		Application Number	
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		Application Number	
Title of Invention	BREAST PUMP SYSTEM		

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**ABSTRACT**

The invention is a wearable breast pump system including a housing shaped at least in part to fit inside a bra and a piezo air-pump. The piezo air-pump is fitted in the housing and forms part of a closed loop system that drives a separate, deformable diaphragm to generate negative air pressure. The diaphragm is removably mounted on a breast shield.

**CLAIMS**

1. A breast pump device that is configured as a self-contained, in-bra wearable device, and includes:

(i) a housing that includes (a) a rechargeable battery, (b) control electronics; (c) a pump generating negative air pressure;

(ii) a breast shield made up of a breast flange and a nipple tunnel and that is configured to be slid in and out of the housing, in which the breast shield is transparent or optically clear and comes in several different sizes, each of which are configured to slide in and out of the same housing; and

(iii) a milk container that is configured to be attached to and removed from the device.

2. The breast pump device of Claim 1, in which the different sizes of the breast shield each provide a different spacing of the nipple from side walls of the nipple tunnel, when the breast shield has been placed onto a breast.

3. The breast pump device of Claim 1, in which the breast shield is rigid.

4. The breast pump device of Claim 1, in which the breast shield is an optically clear, dishwasher safe polycarbonate breast shield.

5. The breast pump device of Claim 1, in which the breast shield attaches using magnets to the housing.

6. The breast pump device of Claim 1, in which the breast shield is configured to rotate smoothly around the nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto the breast.

7. The breast pump device of Claim 1, in which the breast shield presents in use a single continuous surface to the nipple and breast.

8. The breast pump device of Claim 1, in which the breast integrates the breast flange and nipple tunnel as a single item.

9. The breast pump device of Claim 1, in which the breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.

10. The breast pump device of Claim 1, in which the breast shield is configured to slide into the housing with a single push action.

11. The breast pump device of Claim 1, in which the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump.

12. The breast pump device of Claim 1, in which the milk container is rigid.

13. The breast pump device of Claim 1, in which the milk container is an optically clear, dishwasher safe polycarbonate milk container.

14. The breast pump device of Claim 1, in which milk container attaches to a lower part of the housing and forms the base of the device.

15. The breast pump device of Claim 1, in which milk container magnetically attaches to the housing.

16. The breast pump device of Claim 1, in which the nipple tunnel includes guide lines running parallel to the sides of the nipple tunnel.

17. The breast pump device of Claim 1, in which the nipple tunnel includes an air hole or passage, and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage.

18. The breast pump device of Claim 1, in which the nipple tunnel includes on its lower surface an opening through which expressed milk flows into the milk container.

19. The breast pump device of Claim 1, in which the housing includes one or more piezo air pumps.

20. The breast pump device of Claim 1, in which the housing includes a USB charging socket.

21. The breast pump device of Claim 1, in which the housing includes a left or right breast selector or toggle switch on the housing, that when selected for a

particular pumping sessions, sends data to a connected app that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast.

22. The breast pump device of Claim 1, in which the housing is shaped to fit inside a bra by having an outer surface that is curved to fit the contours of a bra.

23. The breast pump device of Claim 1, in which the housing is configured to slide in and out of the several different sized breast shields, when the breast shield has been placed onto a breast.

24. The breast pump device of Claim 1, in which the device is configured to deliver a maximum suction of approximately 240mmHg.

25. The breast pump device of Claim 1, in which the device includes a sensor that directly measures the level of the milk in the milk container by measuring the intensity of light reflected from the surface of the milk stored in the container.

26. The breast pump device of Claim 1, in which the includes a tilt sensor system that automatically alerts the mother and/or stops pumping if the tilt angle of the breast pump device exceeds a threshold so that milk spillage is imminent.

27. The breast pump device of Claim 1, in which the includes a left or right breast selector or toggle switch on the housing, that when selected for a particular pumping sessions, sends data to a connected app that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast.

28. The breast pump device of Claim 1, in which the pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.

29. The breast pump device of Claim 1, in which the pump is a lightweight air pump that enables the total mass of the breast pump device, unfilled with milk, to be less than 250gm

30. The breast pump device of Claim 1, in which the device makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

## **BREAST PUMP SYSTEM**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

This is a continuation of U.S. Application No. 16/009,547, filed on June 15, 2018, which  
5 is based on, and claims priority to, GB Application No. 1709561.3, filed June 15, 2017;  
GB Application No. 1709564.7, filed on June 15, 2017; GB Application No. 1709566.2,  
filed on June 15, 2017; and GB Application No. 1809036.5, filed on June 1, 2018, the  
entire contents of each of which being fully incorporated herein by reference.

### **10 BACKGROUND OF THE INVENTION**

#### **1. Field of the Invention**

The field of the invention relates to a breast pump system; one implementation of the  
15 system is a wearable, electrically powered breast pump system for extracting milk from a  
mother.

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copyright rights whatsoever.

#### **2. Description of the Prior Art**

The specification of the present disclosure is broad and deep. We will now describe the  
25 prior art in relation to key aspects of the present disclosure.

##### **Prior art related to breast pump systems**

A breast pump system is a mechanical or electro-mechanical device that extracts milk  
from the breasts of a lactating woman.

30 A typical breast pump design is as shown in WO 96/25187 A1. A large suction  
generating device is provided, which is freestanding. This is attached by air lines to one  
or two breast shields which engage with the user's breasts. A pressure cycle is applied



from the suction generating device, via the air lines, to the breast shields. This generates a pressure cycle on the user's breasts to simulate the suction generated by a feeding child.

5 The suction generating device is a large component that connects to mains power to operate the pumps therein. Milk collection bottles are provided to store the expressed breast milk. In the system of WO 96/36298 A1 separate bottles are provided attached to each breast shield. A single bottle with tubing connecting to each breast shield may also be used. But for a mother to use this discretely, such as in an office environment, specialised bras must be used. In particular, breast-pumping bras which have a central slit,  
10 for the nipple tunnel of the breast shield to extend through, are typically used. The breast shield is held within the bra, with the suction generating device and milk bottle outside the bra.

The fundamental breast pump system has not significantly evolved from this approach,  
15 only minor technical improvements have been made.

However, these systems present a number of significant disadvantages. As the suction generating device is a large freestanding unit connected to mains power, the user may feel tethered to the wall. The known devices typically also require a specific user posture and  
20 undressing to function normally. This is obviously difficult for a user to do discretely, such as in an office setting. The known devices are also typically noisy, uncomfortable, and hard to clean.

Fully integrated wearable breast pump systems have begun to enter the market, such as  
25 described in US 2016 0206794 A1. In such pump systems, the suction source, power supply and milk container are contained in a single, wearable device; there is no need for bulky external components or connections. Such devices can be provided with a substantially breast shaped convex profile so as to fit within a user's bra for discrete pumping, as well as pumping on-the-go without any tethers to electrical sockets or  
30 collection stations. The internal breast shield is naturally convex to fit over a breast.

In US 2016 0206794 A1, when viewed from the front, the breast pump device has a 'tear-drop' rounded shape, fuller at its base than at its top. But it uses collapsible bags as milk collection devices. As the collection bag systems are collapsible, it can be difficult

for a user to extract all of their milk from the bag, due to the small cut opening that is needed and the capillary action between the bonded plastic sheets that form the bag. This waste can be disheartening for the user, as this is food for their child. The bags are also not re-usable, so the user is required to purchase and maintain a stock of these. As well  
5 as presenting a recurring cost, if the user runs out of stock they are unable to use the product until more bags are purchased.

Furthermore, as a result of the collapsible bags, a complex and somewhat noisy pumping arrangement is necessary. In particular, the breast shield connects to a tube which is  
10 provided with compression units which “step” the expressed milk through the tube to the collection bag. This uses the breast milk as a hydraulic fluid to generate suction on the breast. In order to carry this out, a complex sequenced pulsing arrangement must be implemented.

15 In addition to these systems being particularly complex and wasteful, only a relatively small bag can be used. In US 2016 206794, approximately 110 ml (4 fluid ounces) of milk can be collected before the bag must be changed. While this may be sufficient for some users, others may produce much more milk in a session.

20 A further integrated wearable breast pump system is shown in US 2013 0023821 A1. In the third embodiment in this document, the breast pump system includes a motor driven vacuum pump and power source. An annular (or punctured disc) membrane is provided, with the flow path of the milk going through the centre of the annulus. The membrane is housed in separate housing and is sealed at its inner and outer edges. The breast shield  
25 has a small protrusion to engage with these housing components. However, the design of this breast pump system results in a number of problems. The use of an annular membrane, with the fluid flow path running through the opening of the annulus is undesirable as it results in a large and bulky device. There is therefore a need for improved integrated breast pump systems.

30

#### **Prior Art related to liquid measurement systems**

In the context of breast pump systems, it is useful to measure the quantity of expressed milk. One way to do this is to have a clear container for the breast pump, through which the level of expressed milk inside the container can be seen. However, viewing the milk

bottle is not always possible, for example in a breast pump that collects milk while being worn inside a maternity bra.

5 An existing apparatus for detecting the level of liquid inside a container of a breast pump is that disclosed in US 2016/296681. In this apparatus, a sensing mechanism is provided at the top of a container, which detects droplets of liquid, specifically breast milk, entering the container. By detecting these droplets entering the container, the apparatus can determine the quantity of liquid which enters the container. In this apparatus, an accurate indication of the level of liquid in the container is reliant on the sensing  
10 mechanism being able to accurately record every droplet entering the container.

Particularly at times when liquid enters the container at a high flow rate, this accuracy cannot be guaranteed, leading to significant cumulative errors. An accurate indication of the level of liquid in the container in this apparatus is also reliant on the sensing  
15 mechanism always being on during the pumping process, so that power consumption of the sensing mechanism is correspondingly high.

In view of the above, there is the need for an improved way to determine the level of liquid inside a container connected to a breast pump.

20

#### **Prior Art related to bra clips**

Many specialised bras (or brassieres) exist for maternity use and that facilitate nursing and/or breast pumping for milk collection, without the need to remove the bra itself. In a traditional nursing bra, this is achieved with the use of an at least partially detachable  
25 cup, which can be unhooked for feeding and/or pumping.

Further specialised bras are known which are provided with cut-out portions or slits which substantially align with the wearer's areola and nipple. Traditional breast pump systems comprise an elongate breast shield which extends away from the breast towards  
30 an external bottle and source of suction. The breast shield is arranged to extend through the cut-out portion or slit, with the collection bottle and pumping apparatus placed outside of the bra. These systems require the user to remove or unbutton any overgarments, and are uncomfortable when not pumping.

Integrated, wearable breast pump systems have begun to enter the market, such as previously noted US 2016 0206794 A1. In such pumps, the suction source, power supply and milk container are all in a single, wearable device, as noted above, without the need for bulky external components or connections. Such devices can be provided with a substantially breast shaped profile so as to fit within a user's bra for discrete pumping, as well as pumping on-the-go without any tethers to electrical sockets or collection stations.

Maternity (or nursing) bras such as disclosed in US 4,390,024 A have partially detachable cups, with several hooks provided along the bra strap for attaching the cups to the strap. The cups can then be attached to different hooks in order to adjust the bra strap length. However, these attachment points are fixed. Additionally, this bra has been designed to accommodate the change in breast size before and after the feeding/pumping process. It is not designed to accommodate a breast pump. Accordingly, there is a need for a better system to accommodate integrated wearable breast pumps.

## **SUMMARY OF THE INVENTION**

The invention is a wearable breast pump system including: a housing shaped at least in part to fit inside a bra; a piezo air-pump fitted in the housing and forming part of a closed loop system that drives a separate, deformable diaphragm to generate negative air pressure, that diaphragm being removably mounted on a breast shield.

## BRIEF DESCRIPTION OF THE FIGURES

Aspects of the invention will now be described, by way of example(s), with reference to the following Figures, which each show features of various implementations of the invention including optional features that may be utilised:

- Figure 1** is a front view of an assembled breast pump system.
- Figure 2** is a rear view of the assembled breast pump system of Figure 1.
- Figure 3** is a front view of a partially disassembled breast pump system.
- 10 **Figure 4** is a rear view of the partially disassembled breast pump system of Figure 3.
- Figure 5** is a front view of a further partially disassembled breast pump system.
- Figure 6** is a rear view of the further partially disassembled breast pump system of Figure 5.
- 15 **Figure 7** is a front view of the breast pump system of Figure 1, with the outer shell translucent for ease of explanation.
- Figure 8** is a further front view of the breast pump system of Figure 1, with the front of the outer shell removed for ease of explanation.
- Figure 9** is a schematic view of a nipple tunnel for a breast shield.
- Figure 10** is a schematic of a pneumatic system for a breast pump system.
- 20 **Figure 11** is a schematic of an alternative pneumatic system for a breast pump system.
- Figure 12** is a schematic of a further alternative pneumatic system for a breast pump system.
- Figure 13** is a graph depicting measured pressure in the breast pump system of Figure 12 over time.
- 25 **Figure 14** shows schematics for breast shield sizing and nipple alignment.
- Figure 15** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 16** shows a screenshot of an application running on a device connected to the breast pump system.
- 30 **Figure 17** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 18** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 19** shows a screenshot of an application running on a device connected to the

breast pump system.

**Figure 20** shows a screenshot of an application running on a connected device.

**Figure 21** shows a screenshot of an application running on a connected device.

**Figure 22** shows a screenshot of an application running on a connected device.

5 **Figure 23** shows a screenshot of an application running on a connected device.

**Figure 24** shows a screenshot of an application running on a connected device.

**Figure 25** shows a screenshot of an application running on a connected device.

**Figure 26** shows a diagram of a breast pump sensor network,

10 **Figure 27** shows a sectional view of a device being used to determine the level of liquid  
in a container;

**Figure 28** shows a sectional view of the device and the container from Figure 27 being  
used at a different orientation.

**Figure 29** shows a sectional view of the device and the container from Figure 27 being  
used whilst undergoing acceleration.

15 **Figure 30** shows a sectional view of the device from Figure 27 being used as part of a  
breast pump assembly.

**Figure 31** shows a sectional view of a device connected between a container and its lid,  
and which is operable to determine the level of liquid inside the container.

**Figure 32** depicts a prior art design for a maternity bra;

20 **Figure 33** depicts a clip and clasp being fitted to a maternity bra.

**Figure 34** depicts an alternative clip for adjustment of a maternity bra.

**Figure 35** depicts the alternative clip of Figure 34.

**Figure 36** depicts an alternative clip for adjustment of a maternity bra.

**Figure 37** depicts an alternative clip for adjustment of a maternity bra.

25 **Figure 38** depicts an alternative clip for adjustment of a maternity bra.

**Figure 39** depicts adjustment of the maternity bra of Figure 37.

**Figure 40** shows a configuration with two piezo pumps mounted in series.

**Figure 41** shows a configuration of two piezo pumps mounted in parallel.

30 **Figure 42** shows a plot of the air pressure generated as a function of time by two piezo  
pumps mounted in series and mounted in parallel respectively.

**Figure 43** shows a plot of the air pressure generated as a function of time by two piezo  
pumps mounted in a dual configuration.

**Figure 44** shows a figure of a pump including two piezo pumps in which each piezo  
pump is connected to a heat sink.

35

## **DETAILED DESCRIPTION**

We will now describe an implementation of the invention, called the Elvie™ pump, in the following sections:

5

**Section A: The Elvie™ Breast Pump System**

**Section B: An IR System**

**Section C: A Bra Clip**

**Section D: Piezo Pumps and Wearable Devices**

10



## Section A: The Elvie™ Breast Pump System

### 1. Elvie™ Breast Pump System Overview

5 An implementation of the invention, called the Elvie™ pump, is a breast pump system that is, at least in part, wearable inside a bra. The breast pump system comprises a breast shield for engagement with the user's breast, a housing for receiving at least a portion of the breast shield and a detachable rigid milk collection container attachable, in use, to a lower face of the housing and connected to the breast shield for collecting milk  
10 expressed by the user, with a milk-flow pathway defined from an opening in the breast shield to the milk collection container. The housing inside also includes a pump for generating a negative pressure in the breast shield, as well as battery and control electronics. Unlike other wearable breast pumps, the only parts of the system that come into contact with milk in normal use are the breast shield and the milk container; milk  
15 only flows through the breast shield and then directly into the milk container. Milk does not flow through any parts of the housing at all, for maximum hygiene and ease of cleaning.

With reference to Figure 1 and Figure 2, the assembled breast pump system 100 includes  
20 a housing 1 shaped to substantially fit inside a bra. The housing 1 includes one or more pumps and a rechargeable battery. The breast pump system includes two parts that are directly connected to the housing 1: the breast shield 7 and a milk container 3. The breast shield 7 and the milk container 3 are directly removable or attachable from the housing 1 in normal use or during normal dis-assembly (most clearly shown in Figure 5). All other  
25 parts that are user-removable in normal use or during normal dis-assembly are attached to either the breast shield 7 or the milk container 3. The breast shield 7 and milk container 3 may be removed or attached for example using a one click or one press action or a push button or any other release mechanism. Audible and/or haptic feedbacks confirm that the pump is properly assembled.

30 The modularity of the breast pump allows for easy assembly, disassembly and replacement of different parts such as the breast shield and milk collection container. This also allows for different parts of the pump to be easily washed and/or sterilised. The breast shield and bottle assembly, both of which are in contact with milk during

pumping, may therefore be efficiently and easily cleaned; these are the only two items that need to be cleaned; in particular, the housing does not need to be cleaned.

5 The housing 1, breast shield 7 that is holding a flexible diaphragm, and milk container 3 attach together to provide a closed-loop pneumatic system powered by piezoelectric pumps located in the housing 1. This system then applies negative pressure directly to the nipple, forms an airtight seal around the areola, and provides a short path for expressed milk to collect in an ergonomically shaped milk container 3.

10 The different parts of the breast shield system are also configured to automatically self-seal under negative pressure for convenience of assembly and disassembly and to reduce the risk of milk spillage. Self-sealing refers to the ability of sealing itself automatically or without the application of adhesive, glue, or moisture (such as for example a self-sealing automobile tire or self-sealing envelopes). Hence once the breast pump system is  
15 assembled it self-seals under its assembled condition without the need to force seals into interference fits to create sealed chambers. A degree of interference fitting is usual however, but is not the predominating attachment mechanism. Self-sealing enables simple components to be assembled together with a light push: for example, the diaphragm just needs to be placed lightly against the diaphragm housing; it will self-seal  
20 properly and sufficiently when the air-pump applies sufficient negative air-pressure. The diaphragm itself self-seals against the housing when the breast shield is pushed into the housing. Likewise, the breast shield self-seals against the milk container when the milk container is pushed up to engage the housing. This leads to simple and fast assembly and dis-assembly, making it quick and easy to set the device up for use, and to clean the  
25 device after a session.

Self-sealing has a broad meaning and may also relate to any, wholly or partly self-energising seals. It may also cover any interference seals, such as a press seal or a friction seal, which are achieved by friction after two parts are pushed together.

30 Whilst one particular embodiment of the invention's design and a specific form of each of the parts of the breast pump system is detailed below, it can be appreciated that the overall description is not restrictive, but an illustration of topology and function that the design will embody, whilst not necessary employing this exact form or number of

discrete parts.

The breast pump system 100 comprises a housing 1 and a milk collection container (or bottle) 3. The housing 1 (including the one or more pumps and a battery) and the container 3 are provided as a unit with a convex outer surface contoured to fit inside a bra. The milk collection container 3 is attached to a lower face 1A of the housing 1 and forms an integral part of the housing when connected, such that it can be held comfortably inside a bra. While the breast pump 100 may be arranged to be used with just the right or the left breast specifically, the breast pump 100 is preferably used with both breasts, without modification. To this end, the outer surfaces of the breast pump 100 are preferably substantially symmetrical.

Preferably, the width of the complete breast pump device (housing 1 and milk container 3) is less than 110 mm and the height of the complete breast pump device is less than 180 mm.

Overall, the breast pump system 100 gives discrete and comfortable wear and use. The system weighs about 224 grams when the milk container is empty, making it relatively lighter as compared to current solutions; lightness has been a key design goal from the start, and has been achieved through a lightweight piezo pump system and engineering design focussed on minimising the number of components.

The breast pump system 100 is small enough to be at least in part held within any bra without the need to use a specialized bra, such as a maternity bra or a sports bra. The rear surface of the breast pump is also concave so that it may sit comfortably against the breast. The weight of the system has also been distributed to ensure that the breast pump is not top heavy, ensuring comfort and reliable suction against the breast. The centre of gravity of the pump system is, when the container is empty, substantially at or below the horizontal line that passes through the filling point on the breast shield, so that the device does not feel top-heavy to a person while using the pump.

Preferably, when the container is empty, the centre of gravity is substantially at or below the half-way height line of the housing so that the device does not feel top-heavy to a user using the pump.

The centre of gravity of the breast pump, as depicted by Figure 1, is at around 60mm high on the centreline from the base of the breast pump when the milk container is empty. During normal use, and as the milk container gradually receives milk, the centre of gravity lowers, which increases the stability of the pump inside the bra. It reduces to  
5 around 40mm high on the centreline from the base of the breast pump when the milk container is full.

The centre of gravity of the breast pump is at about 5.85mm below the centre of the nipple tunnel when the milk container is empty, and reduced to about 23.60mm below the centre of the nipple tunnel when the milk container is full. Generalising, the centre of  
10 gravity should be at least 2mm below the centre of the nipple tunnel when the container is empty.

The breast pump 100 is further provided with a user interface 5. This may take the form of a touchscreen and/or physical buttons. In particular, this may include buttons, sliders, any form of display, lights, or any other componentry necessary to control and indicate  
15 use of the breast pump 100. Such functions might include turning the breast pump 100 on or off, specifying which breast is being pumped, increasing or decreasing the peak pump pressure. Alternatively, the information provided through the user interface 5 might also be conveyed through haptic feedback, such as device vibration, driven from a miniature vibration motor within the pump housing 1.

20 In the particular embodiment of the Figures, the user interface 5 comprises power button 5A for turning the pump on and off. The user interface 5 further comprises pump up button 5B and pump down button 5C. These buttons adjust the pressure generated by the pump and hence the vacuum pressure applied to the user's breast. In  
25 preferable embodiments, the pump up button 5B could be physically larger than the pump down button 5C. A play/pause button 5D is provided for the user to interrupt the pumping process without turning the device off.

The user interface 5 further comprises a breast toggle button 5E for the user to toggle a  
30 display of which breast is being pumped. This may be used for data collection, e.g. via an application running on a connected smartphone; the app sends data to a remote server, where data analysis is undertaken (as discussed in more detail later), or for the user to keep track of which breast has most recently been pumped. In particular, there may be a

pair of LEDs, one to the left of the toggle button 5E and one to the right. When the user is pumping the left breast, the LED to the right of the toggle button 5E will illuminate, so that when the user looks down at the toggle it is the rightmost LED from their point of view that is illuminated. When the user then wishes to switch to the right breast, the toggle button can be pressed and the LED to the left of the toggle button 5E, when the user looks down will illuminate. The connected application can automatically track and allocate how much milk has been expressed, and when, by each breast.

The breast pump system also comprises an illuminated control panel, in which the level of illumination can be controlled at night or when stipulated by the user. A day time mode, and a less bright night time mode that are suitable to the user, are available. The control of the illumination level is either implemented in hardware within the breast pump system itself or in software within a connected device application used in combination with the breast pump system.

As depicted in Figure 1, the housing 1 and milk collection container 3 form a substantially continuous outer surface, with a generally convex shape. This shape roughly conforms with the shape of a 'tear-drop' shaped breast. This allows the breast pump 100 to substantially fit within the cup of a user's bra. The milk collection container 3 is retained in attachment with the housing 1 by means of a latch system, which is released by a one-click release mechanism such as a push button 2 or any other one-handed release mechanism. An audible and/or haptic feedback may also be used to confirm that the milk collection container 3 has been properly assembled.

The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting an additional 2 cm difference. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes of S, M, L, XL, etc. In preferred embodiments, the breast pump 100 of the present invention corresponds to an increase of between 3 or 4 cup sizes of the user according to EN 13402.

A plane-to-plane depth of the breast pump can also be defined. This is defined as the distance between two parallel planes, the first of which is aligned with the innermost

point of the breast pump 100, and the second of which is aligned with the outermost point of the breast pump 100. This distance is preferably less than 100 mm.

Figure 2 is a rear view of the breast pump 100 of Figure 1. The inner surface of the housing 1 and milk collection container 3 are shown, along with a breast shield 7. The housing 1, milk collection container 3 and breast shield 7 form the three major subcomponents of the breast pump system 100. In use, these sub-components clip together to provide the functioning breast pump system 100. The breast shield 7 is designed to engage with the user's breast, and comprises a concave inner flange 7A which contacts the breast. To allow the breast pump 100 to be used on either of the user's breasts, the breast shield 7 is preferably substantially symmetrical on its inner flange 7A.

The inner flange 7A is substantially oval-shaped. While the inner flange 7A is concave, it is relatively shallow such that it substantially fits the body form of the user's breast. In particular, when measured side-on the inner-most point of the flange 7A and the outermost point may be separated by less than 25 mm. By having a relatively shallow concave surface, the forces applied can be spread out over more surface area of the breast. The flatter form also allows easier and more accurate location of the user's nipple. In particular, the flange 7A of the breast shield 7 may extend over the majority of the inner surface of the housing 1 and milk collection container 3. Preferably, it may extend over 80% of this surface. By covering the majority of the inner surface, the breast shield is the only component which contact's the wearer's breast. This leaves fewer surfaces which require thorough cleaning as it reduces the risk of milk contacting a part of the device which cannot be easily sterilized. Additionally, this also helps to disperse the pressure applied to the user's breast across a larger area.

The breast shield 7 substantially aligns with the outer edge 1B of the housing 1. The milk collection container 3 may be provided with an arcuate groove for receiving a lower part of the breast shield 7. This is best shown in later Figures. In the assembled arrangement of Figures 1 and 2, the inner surface of the breast pump 100 is substantially continuous.

The breast shield 7 comprises a shield flange for engaging the user's breast, and an elongate nipple tunnel 9) aligned with the opening and extending away from the user's

breast. Breast shield nipple tunnel 9 extends from a curved section 7B in the breast shield 7. In preferable embodiments the nipple tunnel 9 is integral with the breast shield 7. However, it is appreciated that separate removable/interchangeable nipple tunnels may be used. Curved section 7B is positioned over the user's nipple and areola in use. The  
5 breast shield 7 forms an at least partial seal with the rest of the user's breast around this portion, under the negative air pressure created by an air-pressure pump.

This breast shield nipple tunnel 9 defines a milk-flow path from the inner surface of the breast shield 7A, through the breast shield nipple tunnel 9 and into the milk collection  
10 container 3. The breast shield nipple tunnel 9 is preferably quite short in order to minimise the length of the milk-flow path in order to minimise losses. By reducing the distance covered by the milk, the device is also reduced in size and complexity of small intermediate portions. In particular, the breast shield nipple tunnel 9 may extend less than 70 mm from its start to end, more preferably less than 50 mm. In use, the nipple  
15 tunnel 9 is substantially aligned with the user's nipple and areolae. The nipple tunnel comprises a first opening 9A for depositing milk into the collection container and a second opening 19A for transferring negative air pressure generated by the pump to the user's nipple.

20 The shield flange 7A and nipple tunnel 9 may be detachable from the housing 1 together. The shield flange 7A and nipple tunnel 9 being detachable together helps further simplify the design, and reduce the number of components which must be removed for cleaning and sterilization. However, preferably, the nipple tunnel 9 will be integral with the breast shield 7, in order to simplify the design and reduce the number of components which  
25 must be removed for cleaning and sterilisation.

Figures 3 and 4 are of a partially disassembled breast pump 100 of the present invention. In these Figures, the breast shield 7 has been disengaged from the housing 1 and milk collection bottle 3. As shown in Figure 4, the housing 1 comprises a region or slot 11 for  
30 receiving the breast shield nipple tunnel 9 of the breast shield 7. The breast shield is held in place thanks to a pair of channels (9B) included in the nipple tunnel 9, each channel including a small indent. When pushing the housing 1 onto the breast shield 7, which has been placed over the breast, ridges in the housing (9C) engage with the channels, guiding the housing into position; a small, spring plunger, such as ball bearing in each

ridge facilitates movement of the housing on to the nipple tunnel 9. The ball bearings locate into the indent to secure the housing on to the nipple tunnel with a light clicking sound. In this way, the user can with one hand place and position the breast shield 7 onto her breast and with her other hand, position and secure the housing 1 on to the breast shield 7. The breast shield 7 can be readily separated from the housing 1 since the ball bearing latch only lightly secures the breast shield 7 to the housing 1.

Alternatively, the breast shield 7 may also be held in place by means of a clip engaging with a slot located on the housing. The clip may be placed at any suitable point on the shield 7, with the slot in a corresponding location.

The breast shield nipple tunnel 9 of the breast shield 7 is provided with an opening 9A on its lower surface through which expressed milk flows. This opening 9A is configured to engage with the milk collection bottle 3.

The breast pump 100 further comprises a barrier or diaphragm for transferring the pressure from the pump to the milk-collection side of the system. In the depicted example, this includes flexible rubber diaphragm 13 seated into diaphragm housing 19A. The barrier could be any other suitable component such as a filter or an air transmissive material. Diaphragm housing 19A includes a small air hole into the nipple tunnel 9 to transfer negative air pressure into nipple tunnel 9 and hence to impose a sucking action on the nipple placed in the nipple tunnel 9.

Hence, the air pump acts on one side of the barrier or diaphragm 13 to generate a negative air pressure on the opposite, milk-flow side of the barrier. The barrier has an outer periphery or surface, i.e. the surface of diaphragm housing 19A that faces towards the breast, and the milk-flow pathway extends underneath the outer periphery or surface of the barrier or diaphragm housing 19A. The milk-flow path extending under the outer periphery or surface of the barrier 19A allows for a simpler and more robust design, without the milk-flow pathway extending through the barrier. This provides increased interior space and functionality for the device.

As noted, the milk-flow pathway extends beneath or under the barrier 13 or surface of diaphragm housing 19A. This provides an added benefit of having gravity move the milk down and away from the barrier.



Preferably the milk-flow pathway does not pass through the barrier 32. This results in a simpler and smaller barrier design.

5 As noted, the diaphragm 13 is mounted on diaphragm housing 19A that is integral to the breast shield. This further helps increase the ease of cleaning and sterilisation as all of the components on the “milk” flow side can be removed.

10 The barrier 13 may also provide a seal to isolate the air pump from the milk-flow side of the barrier. This helps to avoid the milk becoming contaminated from the airflow or pumping side (i.e. the non-milk-flow side).

15 Alternatively, the only seal is around an outer edge of the barrier 13. This is a simple design as only a single seal needs to be formed and maintained. Having multiple seals, such as for an annular membrane, introduces additional complexity and potential failure points.

20 As illustrated in Figures 3 and 4, the barrier may include a flexible diaphragm 13 formed by a continuous circular disc shaped membrane which is devoid of any openings or holes. This provides a larger effective “working” area of the diaphragm (i.e. the area of the surface in contact with the pneumatic gasses) than an annular membrane and hence the membrane may be smaller in diameter to have the same working area.

25 The diaphragm 13 is arranged so that the milk-flow pathway extends below and past the outer surface or periphery of the diaphragm 13. This means that the milk-flow pathway does not extend through the diaphragm 13. In particular, the milk-flow pathway is beneath the diaphragm 13. However, the diaphragm 13 may be offset in any direction with respect to the milk-flow pathway, provided that the milk-flow pathway does not extend through the diaphragm 13.

30 Preferably, the diaphragm 13 is a continuous membrane, devoid of any openings. The diaphragm 13 is held in a diaphragm housing 19, which is formed in two parts. The first half 19A of the diaphragm housing 19 is provided on the outer surface of the breast shield 7, above the breast shield nipple tunnel 9 and hence the milk-flow pathway. In

preferred embodiments, the first half 19A of the diaphragm housing 19 is integral with the breast shield. The second half 19B of the diaphragm housing is provided in a recessed portion of the housing 1. The diaphragm 13 self-seals in this diaphragm housing 19 around its outer edge, to form a watertight and airtight seal. Preferably, the self-seal  
5 around the outer edge of the diaphragm 13 is the only seal of the diaphragm 13. This is beneficial over systems with annular diaphragms which must seal at an inner edge as well. Having the diaphragm 13 mounted in the breast pump 100 in this manner ensures that it is easily accessible for cleaning and replacement. It also ensures that the breast shield 7 and diaphragm 13 are the only components which need to be removed from the pump  
10 100 for cleaning. Because the diaphragm 13 self-seals under vacuum pressure, it is easily removed for cleaning when the device is turned off.

Figures 5 and 6 show a breast pump 100 according to the present invention in a further disassembled state. In addition to the breast shield 7 and diaphragm 13 being removed,  
15 the milk collection container 3 has been unclipped. Preferably, the milk collection container 3 is a substantially rigid component. This ensures that expressed milk does not get wasted, while also enhancing re-usability. In some embodiments, the milk collection container 3 may be formed of three sections: a front bottle portion, a rear bottle portion, and a cap. These three sections may clip together to form the milk collection container 3.  
20 This three-part system is easy to empty, easily cleanable since it can be dis-assembled, and easily re-usable. The milk collection container or milk bottle may be formed of at least two rigid sections which are connectable. This allows simple cleaning of the container for re-use. Alternatively, the container may be a single container made using a blow moulding construction, with a large opening to facilitate cleaning. This large  
25 opening is then closed with a cap with an integral spout 35 or 'sealing plate' (which is bayonet-mounted and hence more easily cleaned than a threaded mount spout). A flexible rubber valve 37 (or 'sealing plate seal') is mounted onto the cap or spout 35 and includes a rubber duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump; this ensures that negative air-pressure does not need to be  
30 applied to the milk container and hence adds to the efficiency of the system. The flexible valve 37 self-seals against opening 9A in nipple tunnel 9. Because it self-seals under vacuum pressure, it automatically releases when the system is off, making it easy to remove the milk container.

Preferably, the milk collection container resides entirely below the milk flow path defined by the breast shield when the breast pump system 100 is positioned for normal use, hence ensuring fast and reliable milk collection.

5 The milk collection container 3 has a capacity of approximately 5 fluid ounces (148 ml). Preferably, the milk collection container has a volume of greater than 120 ml. More preferably, the milk collection container has a volume of greater than 140 ml. To achieve this, the milk collection container 3 preferably has a depth in a direction extending away from the breast in use, of between 50 to 80 mm, more preferably between 60 mm to 70  
10 mm, and most preferably between 65 mm to 68 mm.

The milk collection container 3 further preferably has a height, extending in the direction from the bottom of the container 3 in use to the cap or spout or sealing plate 35, of between 40 mm to 60 mm, more preferably between 45 mm to 55 mm, and most  
15 preferably between 48 mm to 52 mm. The cap 35 may screw into the milk collection bottle 3. In particular, it may be provided with a threaded connection or a bayonet and slot arrangement.

Further preferably, the milk collection container has a length, extending from the  
20 leftmost point to the rightmost point of the container 3 in use, of between 100 mm to 120 mm, more preferably between 105 mm to 115 mm, and most preferably between 107 mm to 110 mm.

This cap 35 is provided with a one-way valve 37, through which milk can flow only into  
25 the bottle. This valve 37 prevents milk from spilling from the bottle once it has been collected. In addition, the valve 37 automatically seals completely unless engaged to the breast shield 7. This ensures that when the pump 100 is dismantled immediately after pumping, no milk is lost from the collection bottle 3. It can be appreciated that this one-way valve 37 might also be placed on the breast shield 7 rather than in this bottle cap 35.

30 Alternatively, the milk bottle 3 may form a single integral part with a cap 35. Cap 35 may include an integral milk pouring spout.

In certain embodiments, a teat may be provided to attach to the annular protrusion 31A

or attach to the spout that is integral with cap 35, to allow the container 3 to be used directly as a bottle. This allows the milk container to be used directly as a drinking vessel for a child. The milk collection container may also be shaped with broad shoulders such that it can be adapted as a drinking bottle that a baby can easily hold.

5

Alternatively, or in addition, a spout may be provided to attach to the protrusion 31A for ease of pouring. A cap may also be provided to attach to the protrusion 31A in order to seal the milk collection bottle 3 for easy storage.

10 The pouring spout, drinking spout, teat or cap may also be integral to the milk collection container.

Further, the removable milk collection container or bottle includes a clear or transparent wall or section to show the amount of milk collected. Additionally, measurement  
15 markings (3A) may also be present on the surface of the container. This allows the level of milk within the container to be easily observed, even while pumping. The milk collection container or bottle may for example be made using an optically clear, dishwasher safe polycarbonate material such as Tritan™.

20 The milk collection container or bottle may include a memory or a removable tag, such as a tag including an NFC chip, that is programmed to store the date and time it was filled with milk, using data from the breast pump system or a connected device such as a smartphone. The container therefore includes wireless connectivity and connects to a companion app. The companion app then tracks the status of multiple milk collection  
25 containers or bottles to select an appropriate container or bottle for feeding. The tag of the bottle may also be programmed to store the expiry date of the milk as well as the quantity of the milk stored.

Figures 7 and 8 show front views of a breast pump system 100. The outer-surface of the  
30 housing 1 has been drawn translucent to show the components inside. The control circuitry 71 for the breast pump 100 is shown in these figures. The control circuitry in the present embodiment comprises four separate printed circuit boards, but it is appreciated that any other suitable arrangement may be used.

The control circuitry may include sensing apparatus for determining the level of milk in the container 3. The control circuitry may further comprise a wireless transmission device for communicating over a wireless protocol (such as Bluetooth) with an external device. This may be the user's phone, and information about the pumping may be sent to this device. In embodiments where the user interface comprises a breast toggle button 5E, information on which breast has been selected by the user may also be transmitted with the pumping information. This allows the external device to separately track and record pumping and milk expression data for the left and right breasts.

There should also be a power charging means within the control circuitry 71 for charging the battery 81. While an external socket, cable or contact point may be required for charging, a form of wireless charging may instead be used such as inductive or resonance charging. In the Figures, charging port 6 is shown for charging the battery 81. This port 6 may be located anywhere appropriate on the housing 1.

Figure 8 shows the location of the battery 81 and the pumps 83A, 83B mounted in series inside the housing 1. While the depicted embodiment shows two pumps 83A, 83B it is appreciated that the present invention may have a single pump. Preferably, an air filter 86 is provided at the output to the pumps 83A, 83B. In preferable embodiments, the pumps 83A, 83B are piezoelectric air pumps (or piezo pumps), which operate nearly silently and with minimal vibrations. A suitable piezo pump is manufactured by TTP Ventus, which can deliver in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free flow. The rear side of the second half of the diaphragm housing 19B in the housing 1 is provided with a pneumatic connection spout. The pumps 83A, 83B are pneumatically connected with this connection spout.

Operation of the breast pump 100 will now be described. Once the breast pump 100 is activated and a pumping cycle is begun, the pumps 83A, 83B generates a negative air pressure which is transmitted via an air channel to a first side of the diaphragm 13 mounted on the diaphragm housing 19A. This side of the diaphragm 13 is denoted the pumping side 13B of the diaphragm 13.

The diaphragm 13 transmits this negative air pressure to its opposite side (denoted the milk-flow side 13A). This negative pressure is transferred through a small opening in the

diaphragm housing 19A to the breast shield nipple tunnel 9 and the curved opening 7B of the breast shield 7 that contacts the breast. This acts to apply the pressure cycle to the breast of the user, in order to express milk. The milk is then drawn through the nipple tunnel 9, to the one way valve 37 that remains closed whilst negative pressure is applied.

5 When the negative air pressure is released, the valve 37 opens and milk flows under gravity past the valve 37 and into milk container 3. Negative air pressure is periodically (e.g. cyclically, every few seconds) applied to deliver pre-set pressure profiles such as profiles that imitate the sucking of a child.

10 While the depicted embodiment of the breast pump 100 is provided with two pumps, the following schematics will be described with a single pump 83. It is understood that the single pump 83 could be replaced by two separate piezo air-pumps 83A, 83B as above.

Figure 9 depicts a schematic of a further embodiment of a breast shield nipple tunnel 9  
15 for a breast pump 100. The breast shield nipple tunnel 9 is provided with an antechamber 91 and a separation chamber 93. A protrusion 95 extends from the walls of the breast shield nipple tunnel 9 to provide a tortuous air-liquid labyrinth path through the breast shield nipple tunnel 9. In the separation chamber 93 there are two opening 97, 99. An air opening 97 is provided in an upper surface 93A of the separation chamber 93.  
20 This upper surface 93 is provided transverse to the direction of the breast shield nipple tunnel 9. This opening 97 connects to the first side of the diaphragm housing 19A and is the source of the negative pressure. This airflow opening 97 also provides a route for air to flow as shown with arrow 96. It is appreciated that the tortuous pathway is not necessary and that a breast shield nipple tunnel 9 without such a pathway will work.

25 The other opening 99 is a milk opening 99. The milk opening 99 is provided on a lower surface 93B of the separation chamber 93 and connects in use to the container 3. After flowing through the tortuous breast shield nipple tunnel 9 pathway, the milk is encouraged to flow through this opening 99 into the container 3. This is further aided by  
30 the transverse nature of the upper surface 93A. In this manner, expressed milk is kept away from the diaphragm 13. As such, the breast pump 100 can be separated into a “air” side comprising the pump 83, the connection spout 85 and the pumping side 13B of the diaphragm 13 and a “milk-flow” side comprising the breast shield 7, the milk collection container 3 and the milk-flow side 13A of the diaphragm 13. This ensures that all of the

“milk-flow” components are easily detachable for cleaning, maintenance and replacement. Additionally, the milk is kept clean by ensuring it does not contact the mechanical components. While the present embodiment discusses the generation of negative pressure with the pump 83, it will be appreciated that positive pressure may  
5 instead be generated.

While the embodiments described herein use a diaphragm 13, any suitable structure to transmit air pressure while isolating either side of the system may be used.

10 The breast pump may further comprise a pressure sensor in pneumatic connection with the piezo pump. This allows the output of the pump to be determined.

Figure 10 shows a schematic of a basic pneumatic system 200 for a breast pump 100. In the system 200 milk expressed into the breast shield 7 is directed through the breast  
15 shield nipple tunnel 9 through the torturous air-liquid labyrinth interface 95. The milk is directed through the non-return valve 37 to the collection container 3. This side of the system forms the “milk-flow” side 201.

The rest of the pneumatic system 200 forms the air side 202 and is separated from  
20 contact with milk. This is achieved by way of a flexible diaphragm 13 which forms a seal between the two sides of the system. The diaphragm 13 has a milk-flow side 13A and an air side or pumping side 13B.

The air side 202 of the system 200 is a closed system. This air side 202 may contain a  
25 pressure sensor 101 in pneumatic connection with the diaphragm 13 and the pump 83. Preferably, the pump 83 is a piezoelectric pump (or piezo pump). Due to their low noise, strength and compact size, piezoelectric pumps are ideally suited to the embodiment of a small, wearable breast pump. The pump 83 has an output 83A for generating pressure, and an exhaust to the atmosphere 83B. In a first phase of the expression cycle, the pump  
30 83 gradually applies negative pressure to half of the closed system 202 behind the diaphragm 13. This causes the diaphragm 13 to extend away from the breast, and thus the diaphragm 13 conveys a decrease in pressure into the breast shield 7. The reduced pressure encourages milk expression from the breast, which is directed through the tortuous labyrinth system 95 and the one-way valve 37 to the collection bottle 3.

While in the depicted embodiment the air exhaust 83B is not used, it may be used for functions including, but not limited to, cooling of electrical components, inflation of the bottle to determine milk volume (discussed further later) or inflation of a massage bladder or liner against the breast. This massage bladder may be used to help mechanically encourage milk expression. More than one massage bladder may be inflated regularly or sequentially to massage one or more parts of the breast. Alternatively, the air pump may be used to provide warm air to one or more chambers configured to apply warmth to one or more parts of the breast to encourage let-down.

10

The air side 202 further comprises a two-way solenoid valve 103 connected to a filtered air inlet 105 and the pump 83. Alternatively, the filter could be fitted on the pump line 83A. If the filter is fitted here, all intake air is filtered but the performance of the pump may drop. After the negative pressure has been applied to the user's breast, air is bled into the system 202 through the valve 103 in a second phase of the expression cycle. In this embodiment, the air filter 105 is affixed to this inlet to protect the delicate components from degradation. In particular, in embodiments with piezoelectric components, these are particularly sensitive.

15

The second phase of the expression cycle and associated switching of valve 103 is actioned once a predefined pressure threshold has been reached. The pressure is detected by a pressure sensor 101.

20

In certain embodiments, if the elasticity and extension of the diaphragm 13 may be approximated mathematically at different pressures, the pressure measured by sensor 101 can be used to infer the pressures exposed to the nipple on the opposite side of the diaphragm 13. Figure 11 shows an alternative pneumatic system 300. The core architecture of this system is the same as the system shown in Figure 10.

25

In this system 300, the closed loop 202 is restricted with an additional three way solenoid valve 111. This valve 111 allows the diaphragm 13 to be selectively isolated from the rest of the closed loop 202. This additional three way valve 111 is located between the diaphragm 13 and the pump 83. The pressure sensor 101 is on the pump 83 side of the three way valve 111. The three way valve 111 is a single pole double throw (SPDT) valve,

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wherein: the pole 111A is in pneumatic connection with the pump 83 and pressure sensor; one of the throws 11 is in pneumatic connection with the diaphragm 13; and the other throw 111C is in pneumatic connection with a dead-end 113. This dead-end 113 may either be a simple closed pipe, or any component(s) that does not allow the flow of  
5 air into the system 202. This could include, for example, an arrangement of one-way valves.

In this system 300, therefore, the pump 83 has the option of applying negative pressure directly to the pressure sensor 101. This allows repeated testing of the pump in order to  
10 calibrate pump systems, or to diagnose issues with the pump in what is called a dead end stop test. This is achieved by throwing the valve to connect the pump 83 to the dead end 113. The pump 83 then pulls directly against the dead end 113 and the reduction of pressure within the system can be detected by the pressure sensor 101.

15 The pressure sensor detects when pressure is delivered and is then able to measure the output of the pumping mechanism. The results of the pressure sensor are then sent to an external database for analysis such as a cloud database, or are fed back to an on-board microcontroller that is located inside the housing of the breast pump system.

Based on the pressure sensor measurements, the breast pump system is able to  
20 dynamically tune the operation of the pumping mechanism (i.e. the duty or pump cycle, duration of a pumping session, the voltage applied to the pumping mechanism, the peak negative air pressure) in order to ensure a consistent pressure performance across different breast pump systems.

In addition, the breast pump system, using the pressure sensor measurements, is able to  
25 determine if the pump is working correctly, within tolerance levels. Material fatigue of the pump is therefore directly assessed by the breast pump system. Hence, if the output of the pumping mechanism degrades over time, the breast pump system can tune the pumping mechanism operation accordingly. As an example, the breast pump system may increase the duration of a pumping session or the voltage applied to the pumping  
30 mechanism to ensure the expected pressures are met.

This ensures that the user experience is not altered, despite the changing output of the pump as it degrades over time. This is particularly relevant for piezo pumps where the output of the pump may vary significantly.

The microcontroller can also be programmed to deliver pre-set pressure profiles. The pressure profiles may correspond to, but not necessarily, any suction patterns that would mimic the sucking pattern of an infant. The patterns could mimic for example the sucking pattern of a breastfed infant during a post birth period or at a later period in  
5 lactation.

The profiles can also be manually adjusted by the user using a control interface on the housing of the breast pump system or on an application running on a connected device.

10 Additionally, the user is able to manually indicate the level of comfort that they are experiencing when they are using the system. This can be done using a touch or voice-based interface on the housing of the breast pump system itself or on an application running on a connected device.

15 The system stores the user-indicated comfort levels together with associated parameters of the pumping system. The pressure profiles may then be fine scaled in order to provide the optimum comfort level for a particular user.

The profiles or any of the pumping parameters may be calculated in order to correlate with maximum milk expression rate or quantity.

20

The pressure profiles or any of the pumping parameters may also be dynamically adjusted depending on the real time milk expression rate or quantity of milk collected. The pressure profiles or any of the pumping parameters may also be dynamically adjusted when the start of milk let-down has been detected.

25

Additionally, the system is also able to learn which parameters improve the breast pump system efficiency. The system is able to calculate or identify the parameters of the pumping mechanism that correlate with the quickest start of milk let-down or the highest volume of milk collected for a certain time period. The optimum comfort level for a  
30 particular user may also be taken into account.

Figure 12 shows a schematic for a system 400 for a breast pump 100 which can estimate the volume of milk collected in the collection container 3 from data collected on the air-side part 202 of the system 400.

The pump 83 is connected to the circuit via two bleed valves 126, 128. The first bleed valve 126 is arranged to function when the pump 83 applies a negative pressure. As such, this valve 126 is connected to a “bleed in” 127, for supplying atmospheric air to the system 202.

The second bleed valve 128 is arranged to function when the pump 83 applies a positive pressure. As such, this valve 128 is connected to a “bleed out” 129 for bleeding air in the system 202 to the atmosphere.

Although Section C describes the preferred embodiment for measuring or inferring the volume of milk collected in the milk collection container using IR sensors, an alternative method for measuring or inferring the volume of milk collected in the milk collection container using pressure sensors is described also below.

During a milking pump cycle, the pump 83 applies negative pressure on the air side 13B of the diaphragm 13 which causes its extension towards the pump 83. This increases the volume of the space on the milk side 13B of the diaphragm 13. This conveys the decrease in pressure to the breast to encourage expression of milk. A set of three non-return valves 121, 123, 125 ensure that this decrease in pressure is applied only to the breast (via the breast shield 7) and not the milk collection container 3. To measure the volume of milk collected in the container 3, the pump 83 is used instead to apply positive pressure to the diaphragm 13. The diaphragm 13 is forced to extend away from the pump 83 and conveys the pressure increase to the milk side 201 of the system 400. The three non-return valves 121, 123, 125 ensure that this increase in pressure is exclusively conveyed to the milk collection container 13.

The breast pump may further comprise: a first non-return valve between the milk flow side of the diaphragm and the breast shield, configured to allow only a negative pressure to be applied to the breast shield by the pump; a second non-return valve between the milk-flow side of the diaphragm and the milk collection container configured to allow only a positive pressure to be applied to the milk collection container by the pump; and a pressure sensor in pneumatic connection with the pressure-generation side of the diaphragm.

The resulting pressure increase is monitored behind the diaphragm 13 from the air-side 202 by a pressure sensor 101. Preferably, the pressure sensor 101 is a piezoelectric pressure sensor (piezo pressure sensor). The rate at which the pump 83 (at constant strength) is able to increase the pressure in the system 400 is a function of the volume of air that remains in the milk collection container 3. As air is many times more compressible than liquid, the rate at which pressure increases in the system 400 can be expressed as an approximate function of the volume of milk held in the collection container 3.

Thus by increasing the pressure in this fashion, the rate of pressure increase can be determined, from which the volume of milk held in the container 3 is calculable. Figure 13 shows repeated milking and volume measurement cycles as the collection container 3 is filled. To determine the rate of pressure increase the pump 83 was run for a fixed time. As pumping proceeds and the volume of air reduces in the system 400, the pump 83 is able to achieve a higher pressure. Each milking cycle is represented by a positive pressure spike 41. There is a clear upwards trend 43 in magnitude of positive pressures achieved as the collection container 3 is filled.

A method of estimating the pressure applied by a breast pump may comprise the steps of: selecting a pressure cycle from a pre-defined list of pressure cycles; applying pressure with the pump to stimulate milk expression; reading the output of the pressure sensor; and adjusting the applied pressure of the pump to match the pressure profile selected. This allows for repeatable application of force to the breast, even as the pump performance degrades.

Preferably the method further comprises the steps of: approximating the elasticity and extension of the diaphragm at the relevant pressure; and calculating an estimated applied pressure based upon the output of the pressure sensor and the approximated elasticity and extension of the diaphragm.

Alternatively, a method of estimating the milk collected by a breast pump may comprise the steps of: generating a positive pressure with the pump; transmitting the positive pressure via the diaphragm and second non-return valve to only the milk collection

container; measuring the increase in pressure by the pressure sensor in pneumatic connection with the diaphragm; estimating the volume of milk inside the milk collection container based upon the rate of increase of pressure. In this manner, the volume of milk can be estimated remotely.

5

In this manner, an estimate can be obtained for the volume of milk in the container 3 based upon the measured pressures.

10

Figure 13 also shows a dead end stop pump test 45 as described above. The negative spike shows the application of negative pressure directly to the pressure sensor 101.

## 2. Breast shield sizing and nipple alignment

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The correct sizing of the breast shield and the alignment of the nipple in the breast shield are key for an efficient and comfortable use of the breast pump. However breast shape, size as well as nipple size and position on the breast vary from one person to another and one breast from another. In addition, women's bodies often change during the pumping life cycle and consequently breast shield sizing may also need to be changed. Therefore, a number of breast shield sizes are available. Guide lines for correct nipple alignment are also provided.

20

With reference to Figure 14, three breast shield sizes are shown (A1, B1, C1). The substantially clear breast shield gives an unobstructed view of the breast and allows a user to easily confirm that she has the appropriate sized shield for her breast.

25

In order to determine the correct breast shield size and nipple alignment, the breast shield and the diaphragm are detached from the housing and placed on the breast with the sizing symbol facing upwards (with the diaphragm positioned below the nipple) and the nipple aligned in the centre of the fit lines (as shown in A2, B2, C2). The transparent breast shield allows the user to observe the nipple while adjusting the position of the breast shield in order to align the nipple correctly near the centre of the breast shield nipple tunnel. Prior to using the pump, the nipple is aligned correctly, and the breast shield is pushed into place ensuring the seal is correctly positioned on the breast shield. The fit lines should be directly aligned with the outside of the nipple. The correct

30

alignment is illustrated B2.

When the nipple is correctly aligned, the user then rotates the breast shield in order for the diaphragm to be positioned on top of the nipple. The user may then quickly assemble  
5 the rest of the breast pump (i.e. the housing and the milk container) on the breast shield via a one-click attachment mechanism confirming correct engagement, which may be performed one-handed. Nipple alignment may therefore be easily maintained. Audio and/or haptic feedback may also be provided to further confirm correct engagement.

10

### 3. Connected Device Application

Figures 15 to 20 show examples of screenshots of a connected device application that may be used in conjunction with the breast pump system as described above. The interface shown here is an example only and the same data may be presented via any  
15 conceivable means including animated graphics, device notifications, audio or text descriptions.

Figure 15 shows a homepage of the application with different functions provided to the user which can be accessed either directly while pumping or at a later time in order for  
20 example: to review pump settings or the history of previous pumping sessions.

Figure 16 shows a status page with details of remaining battery life, pumping time elapsed and volume of milk inside the milk container.

Figure 17 shows screenshots of a control page, in which a user is able to control different pump parameters for a single breast pump (A) or two breast pumps (B). The user may press on the play button to either start, pause, or resume a pumping activity. The user may also directly increase or decrease the rate of expression using the (+) or (-) buttons. When only one breast is being pumped (A), the user may also indicate if it is either the  
25 right or left breast that is being pumped. The user may also control the pump peak pressure or alternatively may switch between different pre-programmed pressure profiles such as one mimicking the sucking pattern of a baby during expression or stimulation cycle.  
30

Figure 18 shows a page providing a summary of the last recorded pumping session.

Figure 19 shows a page providing a history of previous pumping sessions. The user may scroll down through the page and visualize the data related to specific pumping sessions as a function of time.

5 The application is also capable of providing notifications relating to pumping. Figure 20 shows a screenshot of the application, in which a user is provided a notification when the milk collection bottle is full. Other generated notifications may include warnings about battery life, Bluetooth connection status or any other wireless communication status, status of miss-assembly, excessive movement or lack of expression.

10

Figure 21 shows a further example with a screenshot of an application running on a connected device. The page shows the pumping status when a user is using a double pump mode of operation with a pump on each breast. The user is able to manually control each pump individually and may start, stop or change a pumping cycle, increase  
15 or decrease each pump peak pressure, or switch between different pre-program pressure profiles such as one mimicking the sucking pattern of a baby during an expression or stimulation cycle. The application also notifies the user when a milk collection container is nearly full as shown in Figure 22.

20 Figure 23 shows a status page with an alert notifying the user that the milk collection container of the pump on the right breast is full. A message is displayed that the pump session has paused and that the milk collection container should be changed or emptied before resuming pumping.

25 With reference to Figure 24, when the left and right pump are stopped or paused, the application displays the elapsed time since the start of each session (right and left), the total volume of milk collected in each bottle.

30 With reference to Figure 25, a page summarising the last session (with a double pump mode) is displayed.

In addition to the data provided to the user, and their interactions with the application, the app will also hold data that the user does not interact with. For example, this may include data associated with pump diagnostics. In addition to all functions and sources of

data discussed above, the application may itself generate metadata associated with its use or inputs, notes or files uploaded by the user. All data handled within the mobile application can be periodically transferred to a cloud database for analysis. An alternative embodiment of the breast pump system may include direct contact between the database and the pump, so that pumping data may be conveyed directly, without the use of a smartphone application.

In addition to providing data to the cloud, the application may also provide a platform to receive data including for example firmware updates.

#### 4. Breast pump data analysis

The discreet, wearable and fully integrated breast pump may offer live expression monitoring and intelligent feedback to the user in order to provide recommendations for improving pump efficiency or performance, user comfort or other pumping/sensing variables, and to enable the user to understand what variables correlate to good milk flow.

Examples of variables automatically collected by the device are: time of day, pump speed, pressure level setting, measured pressure, pressure cycle or duty cycle, voltage supplied to pumps, flow rate, volume of milk, tilt, temperature, events such as when let-down happens, when a session is finished. The user can also input the following variables: what side they have pump with (left or right or both), and the comfort level.

This is in part possible because the live milk volume measurement system functions reliably (as discussed in Section B). The breast pump system includes a measurement sub system including IR sensors that measures or infers milk flow into the milk container, and that enables a data analysis system to determine patterns of usage in order to optimally control pumping parameters. The generated data may then be distributed to a connected device and/or to a cloud server for analysis in order to provide several useful functions.

Figure 26 illustrates an outline of a smart breast pump system network which includes the breast pump system (100) in communication with a peripheral mobile device and application (270) and several cloud-based databases (268, 273). The breast pump system



(100) includes several sensors (262). Sensor data refers to a broad definition including data generated from any sensor or any other analogue/digital reading directly from the motherboard or any other component. However, within the embodiment detailed, these measurements include one or more of the following, but not limited to: milk volume  
5 measurements, temperature sensor readings, skin temperature sensing, pressure sensor readings, accelerometer data and user inputs through any physical device interface.

The device also contains a number of actuators, including, but not restricted to: piezoelectric pump(s), solenoid valve(s), IREDs and an LED display. Sensors and  
10 actuators within the device are coordinated by the CPU (263). In addition, any interactions, and data from these components, may be stored in memory (264).

Further to these components, the device also contains a communication chip, such as a Bluetooth chip (265) which can be used to communicate wirelessly with connected  
15 devices such as a peripheral mobile device (270). Through this connection any sensor data (267) generated in the breast pump can be sent to the connected device. This user data, along with any other metadata generated from a connected device app, can be provided to an online database which aggregates all user data (273). In addition, the communication chip will also allow the sending of user control data / firmware updates  
20 from the connected device to the breast pump system (266).

Raw data (271) collected from the measurement sub-system including sensors (262) may be analysed on a cloud database and the analysed data may be stored on the cloud (272). Through inferences provided by the analysed data, firmware updates (269) may be  
25 developed. These can be provided for download to the pump through, for example, an online firmware repository or bundled with the companion app in the connected device app store (268).

In addition, it should be appreciated that despite the sophistication of the proposed  
30 breast pump network, the breast pump still retains complete functionality without wireless integration into this network. Relevant data may be stored in the device's memory (264) which may then be later uploaded to the peripheral portion of the system when a connection is established, the connection could be via USB cable or wireless.

The measurement sub-system may analyse one or more of the following:

- the quantity of the liquid in the container above its base;
- the height of the liquid in the container above its base;
- the angle the top surface of the liquid in the container makes with respect to a  
5 baseline, such as the horizontal.

Based on whether the quantity and/or the height of the liquid in the container above its base is increasing above a threshold rate of increase, a haptic and/or visual indicator indicates if the pump is operating correctly to pump milk. For example, the visual  
10 indicator is a row of LEDs that changes appearance as the quantity of liquid increases.

The visual indicator may provide:

- an estimation of the flow rate;
- an estimation of the fill rate;
- 15 • an indication of how much of the container has been filled.

As a further example, an accelerometer may infer the amount of movement or tilt angle during a pumping session. If the tilt angle exceeds a threshold, the system warns or alerts the user of an imminent spillage, or provides the user with an alert to change position.  
20 Alternatively, the system may also stop pumping to prevent spillage, and once the tilt angle reduces below the threshold, pumping may resume automatically. By sensing the movement or title angle during a pumping session, the system may also derive the user's activity such as walking, standing or lying.

25 Many variables can affect milk expression and data analysis of these multiple variables can help mothers to achieve efficient pumping regimes and improve the overall user experience.

Therefore, the measurement sub-system measures or infers milk flow into the milk  
30 container and enables a user to understand what variables (e.g. time of day, pump setting) correlates to good milk flow. The amount of milk expressed over one or more sessions is recorded as well as additional metrics such as: time of day, pump setting, length of a single pumping session, vacuum level, cycle times, comfort, liquids consumed by the mother. Live data or feedback is then provided to the user to ensure the breast pump is

being used properly and to support the user in understanding the variables that would correspond to the specific individual optimum use of the breast pump.

Furthermore, live data can be used to automatically and intelligently affect specific pumping parameters in order to produce the most efficient pumping session. For example, if the rate of expression increases, the milking cycle might be adjusted accordingly to achieve a more efficient, or more comfortable pumping cycle.

The measurement sub-system also enables a data analysis system to determine patterns of usage in order to optimally control pumping parameters. Collected metrics are transferred through wireless connections between the pump, a connected device or app and a cloud database. Additionally, the application can also connect to other apps residing on the connected device, such as fitness app or social media app or any other apps. Further metrics may also include the behaviour or specific usage of the user associated with the connected device while using the pump (detection of vision and/or audio cues, internet usage, application usage, calls, text message).

Different aspects of pumping can be automatically changed based on dynamic sensor feedback within the breast pump device. The data analysis system is able to access real-time data of pumping sessions and may be used to perform one or more of the following functions, but not limited to:

- indicate whether the milk is flowing or not flowing,
- measure or infer the quantity and/or height of the liquid in the container above its base,
- give recommendations to the mother for optimal metrics for optimal milk flow,
- give recommendations to the mother for optimal metrics for weaning,
- give recommendations to the mother for optimal metrics for increasing milk supply (e.g. power pumping),
- give recommendations to the mother for optimal metrics if an optimal session start time or a complete session has been missed,
- automatically set metrics for the pumping mechanism, such as length of a single pumping session, vacuum level, cycle times.
- automatically stop pumping when the milk container is full,
- automatically adjust one or more pumping parameters to achieve an optimum

pumping session,

- automatically adjust one or more pumping parameters to achieve a comfortable pumping session,
- automatically change the pumping cycle from a programmed cycle to another different programmed cycle, such as from a stimulation cycle to an expression cycle.

5

10

In addition, sensor feedback might be used to improve the physical function of the breast pump system itself. For example, an array of piezoelectric pumps may be dynamically adjusted in response to their operating temperatures so as to optimise the total life of the component whilst maintaining peak pressures.

15

Many additional embodiments may be described for these simple feedback systems, yet the premise remains: real-time sensor feedback is used to automatically and dynamically adjust actuator function. Each feedback program may feasibly include any number and combination of data sources and affect any arrangement of actuators.

20

The data generated can also be used to generate large datasets of pumping parameters, user metadata and associated expression rates, therefore allowing the analysis of trends and the construction of associations or correlations that can be used to improve pumping efficiency, efficacy or any function related to effective milk expression. The analysis of large user datasets may yield useful general associations between pumping parameters and expression data, which may be used to construct additional feedback systems to include on firmware updates.

25

Multiple data sources can be interpreted simultaneously and several different changes to pumping might be actuated to increase pumping efficiency, user experience or optimize pump performance.

30

Collected metrics may be anonymised and exported for sharing to other apps, community or social media platforms on the connected device, or to an external products and services, such as community or social media platform. By contrasting the performance of different users in the context of associated metadata, users may be grouped into discrete 'Pumper profiles' or communities, which may then be used to

recommend, or action the most appropriate selection of intelligent feedback systems to encourage efficient expression. For example, a higher peak pressure may be recommended for women who tend to move more whilst pumping, so as to achieve more efficient expression.

## SECTION B: IR SYSTEM

This section describes the milk detecting system used in the Elvie™ pump.

5 With reference to Figures 27 and 28, there is shown a device 270 for use in detecting the level of liquid inside a container 275. The device 270 is formed of a housing 271 in which is located a sensing assembly 272 comprising a series of optical emitters 273 (an array of three optical emitters is used on one implementation) which are relative to, and each located at a distance from, an optical receiver 274. In operation of the device as will be  
10 described, each optical emitter 273 is operable to emit radiation which is received by the optical receiver 274. In an embodiment of the invention, the series of optical emitters are each located equidistant from the optical receiver 274.

The optical emitters 273 and the optical receiver 274 from the sensing assembly 272 are  
15 located in a portion 276 of the device 270 which faces the container 275 when the device is connected to the container 275. The portion 276 of the device 270 containing the optical emitters 273 and the optical receiver 274 comprises a window 277 of material which is transparent to optical radiation. In this way, each of the optical emitters 273 and the optical receiver 274 have a line of sight through the window 277 into the container  
20 275 when the device 270 is connected thereto.

A controller 278 comprising a CPU 279 and a memory 280 is provided in the device 270 for controlling the operation of the sensing assembly 272. An accelerometer 281 is also provided in the housing 271, which is operatively connected to the controller 278.  
25 Operation of the device 270 when connected to the container 275 will now be described.

In a principal mode of operation, to determine the level L of liquid inside the container 275, the controller 278 instructs the optical emitters 273 to each emit radiation towards the surface of the liquid inside the container 275 at a given intensity. The optical receiver  
30 274 receives the reflected radiation from each optical emitter 273 via the surface of the liquid and each of these intensities is recorded by the controller.

For each operation of the sensing assembly 272, the controller 278 records the intensities of radiation emitted by each of the optical emitters 273 as intensities IE1; IE2...IEn

(where  $n$  is the total number of optical emitters), and records the intensities of radiation received by the optical receiver 274 from each of the optical emitters 273 as received intensities  $IR_1; IR_2 \dots IR_n$ .

5 By comparing the emitted radiation intensities  $IE_1; IE_2 \dots IE_n$  with the received radiation intensities  $IR_1; IR_2 \dots IR_n$ , the controller 278 calculates a series of intensity ratios  $IE_1:IR_1; IE_2:IR_2 \dots IE_n:IR_n$ , which are then used to determine the level of the liquid inside the container. At the most basic level, if the intensity ratio of  $IE_1:IR_1$  is the same as  $IE_2:IR_2$ , given the optical emitters 273 are equidistant from the optical receiver 274,  
10 this indicates that the level of the liquid inside the container is parallel to the top of the bottle, as shown in Figure 27. In contrast, if these two intensity ratios are different, this indicates that the liquid level is at a different angle, such as that shown in Figure 28.

To accurately determine the level and the quantity of liquid inside the container 275, the  
15 controller 278 processes the recorded intensity ratios using a database located in the memory 280. The database contains an individual record for each container which is operable to connect with the device 270. Each record from the database contains a look-up table of information, which contains expected intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) for the container 275 when filled at different orientations, and with different quantities of  
20 liquid.

By comparing the information from the look-up table with the recorded intensity ratios, the controller 278 calculates the level and quantity of liquid inside the container 275 and stores this information in the memory 280.

25

In situations where a container 275 to the device 270 contains no stored record in the database, the sensing assembly 272 can be used in a calibration mode to create a new record. In the calibration mode, the sensing assembly 272 is operated as the container is filled from empty, and as it is positioned at different orientations. At each point during  
30 the calibration mode, the controller 278 calculates the recorded intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) and stores them in the record relating to the container 275. For each set of recorded intensity ratios, the user includes information in the record relating to the orientation and fill level of liquid inside of the container 275.

To improve the accuracy of the results obtained by the device 270 during its use, the controller 278 when recording each intensity ratio also records a parameter from the accelerometer 281 relating to the acceleration experienced by the device 270. For each recorded acceleration parameter, the controller 278 determines whether the parameter  
5 278 exceeds a predetermined threshold acceleration parameter stored in the memory 280. The predetermined threshold is indicative of an excessive acceleration, which causes sloshing of liquid inside the container 275 connected to the device 270. In the event of a recorded acceleration parameter exceeding the predetermined threshold acceleration parameter, the controller 278 flags the recorded intensity ratios associated with the  
10 recorded acceleration parameter as being unreliable (due to sloshing).

Even without the use of the accelerometer 281, the controller 278 is nonetheless operable to determine whether a set of recorded intensity ratios occur during a period of excess acceleration. In this regard, for each set of intensity ratios recorded at a given  
15 time, the controller 278 checks whether any of these intensity ratios is of a predetermined order of magnitude different than the remaining recorded intensity ratios from the set. In the event that the controller 278 determines that this is the case, this indicates that the liquid inside the container has 'sloshed' as a result of the excess acceleration, as shown in Figure 29. In this event, the controller 278 flags the set of recorded intensity ratios as  
20 being unreliable.

It will be appreciated that instead of recording the relative intensities of radiation emitted by the optical emitters 273 with the radiation received by the optical emitter 274, the controller 278 could instead record the time taken for radiation emitted by each of the  
25 optical emitters 273 to be received by the optical receiver 274. In this arrangement, the look up table would instead contain time periods as opposed to intensity ratios.

In terms of the applications for the device 270, it will be appreciated that the device can be used in a wide variety of applications. One possible application is the use of the device  
30 270 to determine the level of liquid located within a container 275, such as a baby bottle, used as part of a breast pump assembly. In this arrangement, the device 270 is associated with a breast pump 301 which assists with the expression of milk from a breast. The breast pump may be located in the housing 271 of the device 270 as shown in Figure 30, or it may be realisably connected to the housing 271.



Either way, the device 270 would be connectable to the container 275 such that milk expressed by the breast pump can pass from the pump via a channel 302 into the container 275.

5

The breast pump may be any type of breast pump system including any shapes of milk container or bottle and may comprise a pump module for pumping milk from a breast. The pump module being contained within the housing may comprise: a coupling, a container attachable to the housing via the coupling to receive milk from the pump, a  
10 sensing assembly within the housing and comprising at least one optical emitter operable to emit optical radiation towards the surface of the body of milk held in the container when the housing is connected to the container, an optical receiver for receiving the reflected radiation from the surface of the milk, and a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the  
15 level of the milk inside the container based on the reflected radiation received by the optical receiver.

By determining the level of milk inside the container based on reflected radiation from the surface of the milk in the container, there is no need to monitor the individual  
20 droplets of milk entering the container, such that the sensing assembly can avoid errors associated with measuring these droplets. For example, because we take multiple reflection-based measurements once the container is filled, we can generate an average measurement that that is more accurate than a single measurement. But with systems that rely in counting individual droplets, that is not possible – further, systemic errors  
25 (e.g. not counting droplets below a certain size) will accumulate over time and render the overall results unreliable. Furthermore, by not needing to measure these droplets, the sensing assembly from the breast pump need not always be on during the pumping process, which saves power.

30 When at least two optical emitters are used, the sensing assembly from the breast pump may determine the level of milk inside the container more accurately and irrespective of the orientation of the liquid level inside the container.

Each optical emitter may be equidistant from the optical receiver in order for the

controller to easily calculate the level of the milk inside the container based on the reflected radiation originating from each optical emitter. The signals from the optical receiver preferably comprise information relating to the intensity of the radiation received by the optical receiver.

5

Each optical emitter may be operable to emit radiation at a different wavelength, or at a different time, than the other optical emitters. In this way, the controller can more easily process the signals from the optical receiver, and more easily distinguish between the radiation emitted by each of the optical emitters.

10

The optical emitter may emit radiation in the visible range of wavelengths. Alternatively, it may be UV or IR light. The emitted wavelength may be for example between 10nm and 1mm.

15

The sensing assembly may also comprise at least one accelerometer electrically connected to the controller. The controller may be configured to record an accelerometer parameter from the accelerometer and determine whether the accelerometer parameter exceeds a predetermined threshold. The predetermined threshold may be indicative of an excessive acceleration, which might cause sloshing of milk inside any container connected to the

20

breast pump.

25

Another application for the device 270 is as a collar for detecting the level/quantity of liquid in a container 275, such as a baby bottle, via its lid 310. An example of the device 270 being used as such a collar is shown in Figure 31. In this arrangement, the device 270 is located between the container 275 and the lid 310, and comprises a first end 311 having a first coupling 312 for attaching the collar to the lid 310. The device comprises a second end 313 having a second coupling 314 for attaching the device 270 to the container 275. The second coupling may be a screw thread, shown in Figure 31, on the inside surface of the container 275. In this way, the distinctive bottom inside surface can be used by the sensing assembly 272 to more easily calibrate itself to the container 275 on which the distinctive bottom inside surface is located. The distinctive bottom may also be used to help identify which container 275 the device is connected to, and thus which record should be used from the database when the device 270 is used.

30

To further improve the accuracy of the sensing assembly 272, the controller 278 may also be configured to use the recorded information from the accelerometer 281, in situations where the record acceleration is below the predetermined threshold acceleration parameter, to calculate a more accurate liquid level and/or quantity of liquid located  
5 inside the container which is compensated for acceleration.

In one particular arrangement, the controller 278 may poll the accelerometer 281 prior to each operation of the sensing assembly 272 to verify that the device 270 is not currently undergoing excessive acceleration. In the event of the controller 278 determining  
10 excessive acceleration in the device 270, the controller 278 would continually re-poll the accelerometer, and not operate the sensing assembly 272, until the parameter from the accelerometer is determined as being below the predetermined threshold acceleration parameter stored in the memory 280.

It will also be appreciated that for each container record stored in the database, the container record may comprise a plurality of look up tables, wherein each look up table is associated with a particular liquid used in the container, and wherein each look up table contains its own set of intensity ratios. In this way, the device 270 can more accurately determine the level/quantity of different liquids used in a particular container 275.  
20

As described herein, the sensing assembly 272 has been described as having a plurality of optical emitters 273. It will be appreciated however that the sensing assembly could operate using a single optical emitter 273 and plurality of optical receivers 274. In this arrangement, each record from the database would contain a plurality of ratios relating to  
25 the emitted radiation from the optical emitter 273 as received by each of the optical receivers 274. In use of the device 270, the controller 278 would then similarly record the emitted radiation from the optical emitter 273 as received by each of the optical receivers 274. In an alternate arrangement, there may be provided a plurality of optical emitters 273 and a plurality of optical receivers 274, wherein each optical emitter 273 is associated  
30 with a respective optical receiver 274. In its simplest arrangement, the sensing assembly 272 may comprise a single optical emitter 273 and a single optical receiver 274.

In certain configurations, the optical emitters 273 may together emit radiation having the same wavelength. In other configurations, the optical emitters 273 may each emit

radiation having a different wavelength. In this latter configuration, the optical receiver 274 would then be able to determine which optical emitter 273 is associated with any given received radiation, based on the wavelength of the received radiation.

- 5 The optical emitters 273 may also each emit radiation at different times, such to allow the controller 278 to more easily process the signals from the optical receiver 274, and more easily distinguish between the radiation emitted by each of the optical emitters 273.

10 In relation to the electrical connection between the controller 278 and the sensing assembly 272, it will be appreciated this electrical connection may be either a wired/wireless connection as required.

Although not shown in the Figures, the device 270 herein described is preferably powered by a battery or some other power source located in the device 270. In other  
15 embodiments, the device 270 may be powered using mains electricity.

In one configuration, it is also envisaged that rather than the controller 278 comparing the information from the look-up table with the recorded intensity ratios to calculate the level and quantity of liquid inside the container 275, the controller 278 could instead  
20 process the recorded intensity ratios through a liquid-level equation stored in the memory 280. In this configuration, the liquid-level equation could be a generalised equation covering a family of different containers, or could be an equation specific to a container having a given shape and/or type of liquid inside.

25 It will also be appreciated that in some applications of the device 270, the device could be used to detect the level of a solid, as opposed to a liquid, in a container. As used herein, the terms 'optical emitter' and 'optical receiver' are intended to cover sensors which can emit radiation in or close to the optical wavelength. Any type of radiation at or close to the optical wavelength is suitable provided that it does not have any harmful  
30 effects. The exact wavelength is not important in the context of the invention. Such sensors thus include those which can emit visible radiation (such as radiation having wavelengths in the region of 400nm-700nm), and/or those which can emit IR radiation (such as radiation having wavelengths in the region of 700nm-1mm and/or those which can emit UV radiation (such as radiation having wavelengths in the region of 10nm to

400nm).

Existing prior art for such a sensor module is the apparatus disclosed in RU2441367. In this apparatus, the container is an industrially sized milk tank, which only includes a single laser mounted at the top of the tank. Whilst this apparatus is suited for large-sized containers, which do not move in use, the apparatus is less-suited for applications where the container moves in use, or where the liquid level inside the container is non perpendicular to the laser beam shone into the container. In contrast, the sensor module described above can be used in a variety of different applications, is conveniently located within a housing, and which by virtue of it having at least two optical emitters, can determine the level of liquid even inside containers of irregular shapes, and which can determine the level of liquid inside a container irrespective of the orientation of the liquid level inside the container.

Further to the embodiments of the fluid measurement system in different contexts, it can be appreciated that different functions entirely may be possible using the same component structure. For example, it is known that certain molecules within breast milk absorb specific wavelengths of light at characteristic propensities. Whilst the proposed system uses multiplexed IREDs at the same wavelengths to perform proximity measurements, the same array of IREDs may instead be used to emit several different wavelengths of light and determine their absorption upon reflection. If appropriately calibrated, the system may be able to report on the presence or concentration of specific compounds in the expressed milk, such as fat, lactose or protein content.

In addition to this embodiment, it is feasible that the system might be applied to monitor the change in volume of any other container of liquid, given there is sufficient reflection of IR off its surface. These embodiments might include for example: liquid vessel measurement such as for protein shakes, cement or paint, or volume measurements within a sealed beer keg.

## SECTION C: BRA CLIP

This section describes a bra clip that forms an accessory to the Elvie™ pump.

5

It relates to a system allowing a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast pump. As such, the user does not need a specialised adjustable bra; instead the present system works with all conventional maternity bras. The user also does  
10 not have to purchase any larger bras to wear while pumping.

As shown in Figure 32, a typical maternity bra 320 comprises a support structure made up of shoulder straps 321 which support the bra 320 on the wearer's shoulders, and a bra band 322 for extending around a user's ribcage, comprising two wings 323 and a central  
15 panel or bridge 324. The straps 321 are typically provided with adjustment mechanisms 325 for varying the length of the straps 321 to fit the bra 320 to the wearer. At the outermost end of each wing, an attachment region 326 is provided. Typically, hooks 327 and loops 328 are provided for securing the bra 320 at the user's back. However, any other suitable attachment mechanism may be used. Alternatively, the attachment region  
20 326 may be provided at the front of the bra 320 in the bridge region 324, with a continuous wing 323 extending continuously around the wearer's back. Typically, a number of sets of loops 328 are provided to allow for variation in the tightness of the bra 320 on the wearer. While shown as having a separation in Figure 32, the wings 323 and bridge 324 may form a single continuous piece in certain designs. Likewise, while  
25 shown with a distinct separation in Figure 32, the shoulder straps 321 and the wings 323 may likewise form a single continuous piece.

The maternity bra 320 is further provided with two breast-supporting cups 329 attached to the support structure. The cups 329 define a cup size, which defines the difference in  
30 protrusion of the cups 329 from the band 322. The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting a 2 cm difference between the protrusion of the cups 329 from the band 322. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes

of S, M, L, XL, etc.

The cups 329 may be stitched to the bra band 321. At least one of the cups 329, is in detachable attachment with the corresponding strap 321. In particular, this is achieved at attachment point 330 where a hook 331 attached to the bra strap 321 engages with a clasp 331 attached to the cup 329. The hook 331 and the bra strap adjuster 325 are set such that in the closed position, the cup size of the bra 320 fits the wearer's breasts.

In Figure 32, the left cup 329 is shown attached to its attachment point 330, which the right cup 329 is unattached. In this manner, the wearer is able to detach the cup 329 to expose their breast for feeding or for breast pumping. Once this is completed, the cup 329 is reattached and the maternity bra 320 continues to function as a normal bra.

While in the depicted embodiments, a hook 331 is shown on the bra strap 321 and a clasp 332 is shown on the cup 329, it is appreciated that the provision of these may be reversed, or that alternative attachment mechanisms may be used.

A maternity bra therefore may comprise a support structure comprising shoulder straps and a bra band and a first and a second cup each attached to the support structure to provide a first cup size, at least one cup being at least partially detachable from the support structure at an attachment point.

In other embodiments, the detachable attachment point 330 may be provided at a different location, such as at the attachment between the bra band 322 and the cup 329. The mechanism for such an attachment point is the same as described above.

A clip has been designed such that it is configured to be attached to the support structure at a position away from the attachment point. This results in the original attachment point being usable, with the clip providing an alternative attachment point to give, in effect, an adjusted cup size.

Alternatively, the clip may also be attachable to the support structure at a plurality of non-discrete positions. This ensures essentially infinite adjustment of the clip position such that the perfect position for the user can be found.

The clip can also extend between an unextended and an extended state, and can attach to the support structure at the attachment point; the first cup size is providable when the at least partially detachable cup is attached to the clip when the clip is an unextended state; the second cup size is providable when the at least partially detachable cup is attached to the clip when the clip is in an extended state. An extendable clip like this allows quick switching between the two states in use.

Figure 33 depict a clip 335 according to the present invention, along with a clasp 332 shown in isolation from the bra cup 329 it is normally attached to. The clip comprises a first engagement mechanism and at least one second engagement mechanism(s). The clip is attachable in a releasable manner to the support structure at a first position via the first engagement mechanism and attachable in a releasable manner to one of the partially detachable cups via the second engagement mechanism to provide a second cup size different to the first cup size. The clip 335 is provided with a material pathway 336 which receives a portion of the bra strap 321. In the particular embodiment of these Figures, the clip 335 is substantially U-shaped, with a narrowing profile towards its open end. However, it is appreciated that any other suitable shape with a material pathway may be used, such as an S-shape or E-shape. The clip 335 is designed to be attached to the bra strap 321 in a releasable manner, with the slot 336 acting as a support engaging mechanism. The releasable manner means that the clip 335 may be simply removed from the bra 320 without causing any damage to the functioning of the bra 320. To enhance the ease of attachment, the clip 335 may be provided with outwardly extending wings 204 which help direct the bra strap 321 into the clip 335. The clip 335 is further provided with a hook 220 acting as a cup engaging mechanism which can engage with the clasp 332.

Figure 33 (c) shows the clip 335 being attached to a bra strap 321 in order to provide a second attachment point 337 for the clasp 332 to attach to, and hence to provide a second cup size for the bra 320. In this particular embodiment, the clip 335 is attached in a portion of strap 321A below the original attachment point 330 and hence the second attachment point 337 is likewise below the original attachment point. This results in a second cup size larger than the first cup size. In preferred embodiments, as shown in these Figures, the clip 335 engages with the support structure in a direction transverse to



the direction in which it engages with the cup.

Figure 33 (d) and (e) show how a wearer is able to move between the first and second cup sizes. In 33(d), the cup 329 is attached at the first attachment point 330 to provide a first cup size. The wearer then disengages the clasp 332 from the hook 331 at the hook 338 at the second engagement point 239. In this manner, the wearer is easily able to transition between the two cup sizes.

Figures 34 and 35 show an alternative design for a clip 340. This clip 340 is substantially “E-shaped”, with a back portion 341 and first, second and third prongs 342A, 342B, 342C extending transverse from this back portion 341. The three prongs 342A, 342B, 342C are spaced apart along the length of the back portion 341. The first and third prongs 342A, 342C are provided with attachment clips 343A, 343B.

These attachment clips 343A, 343B can engage with the clasp 332 of a bra to provide the second cup size. Depending upon the orientation of the clip 340, one or the other of the attachment clips 343A, 343B will be used to attach the clasp 332 of the bra. By providing these clips 343A, 343B on both of the first and the third prongs 342A, 342C the clip is easily reversible so it can be used on either side of the bra. Preferably the clip 340 is also symmetrical, to aid the reversibility of the clip 340.

Figure 35 shows the clip 340 attached to a bra. As can be seen, the first and third prongs 342A, 342C extend on the front side of the bra strap, with the second prong 342B extending on the rear side of the bra strap. In this manner, the clip 340 is attached to the strap. In preferable embodiments, a grip-enhancing member 344 such as a number of projections and/or roughened patches can be provided on the second prong 342B in order to strengthen this grip.

In alternative embodiments, the attachment clip could be provided on the second, centremost prong 342B. In such an arrangement, the centremost prong 342B would be on the outside of the bra, with the first and third prongs 342A, 342C on the inside.

The provision of the attachable clip allows maternity bras already owned by the wearer to be quickly transformed into bras with quick switchable double cup size options.

This allows the use of integrated wearable breast pumps which increase the user's required cup size. This allows more design freedom for the breast pump in terms of size and shape, while still allowing the user to discretely pump with the pump held within their bra. By allowing conversion of the user's existing maternity bras, they are not forced to purchase specially designed bras to wear with the pump. The bra is hence normally at the first engagement point 330 when the breast pump device is not being used. As shown in Figure 33, the clasp 332 is then engaged by the user to discretely switch between the two configurations, and the user then inserts the pump without any complex adjustment or removal of clothing.

Preferably, the clip will be relatively unobtrusive in size and shape and hence can be left in place when the bra is first put on and used when necessary. To this end, the clip is preferably machine washable without significant damage or degradation.

In some embodiments, the clip may be switchable between positions for engaging with each cup so that a single clip may be used on either side of the bra. To achieve this, the clip is preferably reversible. This may provide the user with a visual indication of which breast has produced milk most recently so switching can take place.

In a preferred embodiment, the first engagement mechanism engages with the support structure in a first direction and the second engagement mechanism engages with the cup in a second direction transverse to the first direction. This increases ease of attachment as with this structure the sideways engagement of the clip to the support structure ensures that the second attachment mechanism is correctly orientated for the cup.

The second engagement mechanism may be one or more of a hook or a snap or a clip. This ensures easy interfacing with the traditional hook and clasp systems already provided on maternity bras.

Preferably the clip further comprises two distinct second engagement mechanisms which can be used interchangeably dependent upon the orientation of the clip. This makes the clip easier to use as it can be quickly switched between each bra strap, and the user does not have to worry which way up to put the clip on.

Preferably, the clip comprises a material pathway with an opening for receiving a portion of the support structure as the first engagement mechanism for securing the clip to the bra. This ensures a quick and simple method for attaching the clip to the bra. In particular, the clip may substantially U-shaped, and the material pathway is between the arms of the U.

Preferably, the clip comprises three prongs extending from a central support, the three prongs arranged as a central prong and two outer prongs so as to receive the support structure on one side of the central prong and on the opposite side of each respective outer prong, at least one prong being provided with the second engagement mechanism. This ensures a strong attachment to the bra and a simple design.

Preferably, both outer prongs are each provided with a respective second engagement mechanism. This ensures that the clip is reversible for easier attachment to the bra.

A method of adjusting the cup size of a maternity bra is provided according to the present invention, comprising: providing a maternity bra comprising: a support structure comprising shoulder straps and a bra band; and a first and second cup each attached to the support structure to provide a first cup size, the at least one cup being detachable from the support structure at an attachment point, providing a clip comprising first and section engagement mechanisms, attaching the first engagement mechanism of the clip in a releasable manner to a first position of the support structure of the maternity bra, attaching one of the detachable cup to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size.

This clip and method allow a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast pump.

Preferably, the method further comprises the step of inserting a breast pump into the detachable cup. The adjustment of the size of the bra allows the bra to support the breast pump against the user's breast for comfort and ease.

Preferably, the method further comprises the steps of: detaching the first engagement mechanism of the clip from the first position support structure of the maternity bra; attaching the first engagement mechanism of the clip in a releasable manner to a second position of the support structure of the maternity bra; and attaching the other of the detachable cups to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size. This allows the user to use a single clip on either of the cups.

An alternative embodiment may be provided, with an extendable clip 360 as shown in Figure 36. In such an embodiment the clip is attached to the hook 331 on the strap 321 in a releasable manner, with the clasp 332 attached to an expandable portion of the clip. The clip is then able to expand between an unexpanded state where the clasp 332 is held in substantially the same position as the first attachment point 330 to provide the first cup size, and an expanded state, where the clasp 332 is held in a second position away from the first attachment point 330 to provide the second cup size.

For example, an elongate clip with first and second opposite ends may be provided. A first attachment point for attaching to the hook 331 is provided at the first end, and a second attachment point for attaching to the clasp 332 is provided at the second end. The elongate clip is hinged between the two ends, such that the clip can be folded between an elongate configuration to a closed configuration where the second end touches the first end. A clasp can be provided on the clip to hold the second end in this closed configuration. Thus, in the closed position the clasp 332 is held in substantially the same location as the first attachment point 330 to provide the first cup size, and in the open position the clasp is held away from the first attachment point 330 to provide the second cup size.

Other extendable clip embodiments are also possible, for example sliding clips or elastic clips.

Additional embodiments of a maternity bra adjuster are provided in Figures 37 and 38. The alternative proposed solution is a small adapter device, which comprises a first portion 370 including a clasp 373 and a second portion 372 including a hook 374, in which the first and second portions are separated by a small distance 371 in order to

provide two different adjustable sizes. The first portion includes a clasp 373 that is designed to attach to the hook on the bra strap 321. It may also include a top hook 375 positioned underneath the clasp, and a clip 376 on the rear side. The second portion includes a bottom hook 372.

5

The clasp 332 that is present on the cup 329 of the maternity bra, may then either engage with the top hook (321) to provide a first cup size, and engage with the bottom hook (332) to provide a second cup size that is different from the first cup size, as illustrated in Figure 39. The user may then discretely switch between a non pumping position, provided by the first cup size, and a second pumping position without any complex adjustment or removal of clothing needed, while using a wearable breast pump system (100).

10

The first portion and second portion may be made of plastic and may be separated by a stretchy material such as elastic or elastomeric material. The first portion may also include a clip on the rear side, the purpose of which is to allow the user to leave the clip attached to the bra for an extended time period.

15

**Section D: Use of Piezo Pump in Wearables**

As described in Section A, the breast pump system includes a piezo air pump, resulting in a fully wearable system that delivers a quiet, comfortable and discreet operation in normal use. This section gives further information on the piezo air pump.

In comparison with other pumps of comparable strength, piezo pumps are smaller, lighter and quieter.

Each individual Piezo pump weighs approximately 6gm and may, with material and design improvements, weigh less than 6gm.

In operation, the Elvie breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise; tests indicate that it makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.

Piezo pumps also have lower current draw, allowing for increased battery life. A piezo pump is therefore ideally suited for wearable devices with its low noise, high strength and compact size. Further, as shown in the breast pump system of Figures 7 and 8, more than one piezo pump may be used.

Whilst a breast pump system is largely described in previous sections, the use of piezo mounted either in series or in parallel can also be implemented in any medical wearable devices or any wearable device. The piezo pump may pump air as well as any liquid.

With reference to Figure 40, a diagram illustrating a configuration of two piezo pumps mounted in series is shown.

With reference to Figure 41, a diagram illustrating a configuration of two piezo pumps mounted in parallel is shown.

With reference to Figure 42, the air pressure generated as a function of time by two piezo pumps mounted in series and two piezo pumps mounted in parallel are compared. In

this example, the parallel configuration produces higher flow rate and achieves -100mmHg negative air pressure faster than the series configuration. In comparison, the series configuration produces lower flow rate and takes slightly longer to reach 100mmHg. However, the parallel configuration cannot achieve as high as a vacuum as the series configuration and plateaus at -140mmHg. In comparison, the series configuration is able to generate about -240mmHg.

A dual configuration is also implemented in which more than one piezo pump is configured such that they can easily switch between a parallel mode and a series mode. This dual configuration would suit wearable devices that would need to achieve either lower or higher pressure faster.

Figure 43 shows a plot of the air pressure generated as a function of time by two piezo pumps mounted in a dual configuration. In this dual configuration, the piezo pumps first start with a parallel mode in order to benefit from faster flow rate, and then switch to a series mode (as indicated by the switch-over point) when stronger vacuums are required, enabling to save up to 500ms on cycle time with elastic loads.

Additionally, a piezo pump may be used in combination with a heat sink in order to efficiently manage the heat produced by the wearable pump. This configuration may be used to ensure that the wearable device can be worn comfortably. The heat sink or heat sinks are configured to ensure that the maximum temperature of any parts of the breast pump system that might come into contact with the skin (especially prolonged contact for greater than 1 minute) are no more than 48°C and preferably no more than 43°C.

The heat sink may store the heat produced by a piezo pump in order to help diverting the heat produced to another location. This not only ensures that the wearable system can be worn comfortably, but also increases the lifetime of a piezo pump.

Figure 44 shows a picture of a wearable breast pump housing including multiple piezo pumps (440). The breast pump system is wearable and the housing is shaped at least in part to fit inside a bra. By applying a voltage to the piezo pumps, the pressure provided by the pumps increase. The generation of higher pressure by the piezo pumps also means higher heat produced that needs to be managed. Each piezo pump is therefore

connected to a heat sink (441), such as a thin sheet of copper. The heat sink has a long thermal path length that diverts the heat away from the piezo pump.

5 The use of a heat sink in combination with a piezo pump is particularly relevant when the wearable device is worn directly or near the body, and where the management of heat induced by the piezo pump is crucial.

10 A wearable device including a piezo pump may therefore include a thermal cut out, and may allow for excess heat to be diverted to a specific location. The heat sink may be connected to an air exhaust so that air warmed by the piezo pumps vents to the atmosphere. For example, the wearable system is a breast pump system and the heat sink stores heat, which can then be diverted to warm the breast shield of the breast pump system.

15 Use cases application include but are not limited to:

- Wound therapy;
- High degree burns;
- Sleep apnoea;
- Deep vein thrombosis;
- 20 • Sports injury.



**APPENDIX: SUMMARY OF KEY FEATURES**

In this section, we summarise the various features implemented in the Elvie™ pump system. We organize these features into six broad categories:

- 5    **A.      Elvie Breast Pump: General Usability Feature Cluster**
- B.      Elvie Piezo Air Pump Feature Cluster**
- C.      Elvie Milk Container Feature Cluster**
- D.      Elvie IR System Feature Cluster**
- E.      Elvie Bra Clip Feature Cluster**
- 10   **F.      Other Features, outside the breast pump context**

Drilling down, we now list the features for each category:

**A.      Elvie Breast Pump: General Usability Feature Cluster**

- 15    Feature 1      Elvie is wearable and includes only two parts that are removable from the pump main housing in normal use.
- Feature 2      Elvie is wearable and includes a clear breast shield giving an unobstructed view of the breast for easy nipple alignment.
- Feature 3      Elvie is wearable and includes a clear breast shield with nipple guides for easy breast shield sizing.
- 20    Feature 4      Elvie is wearable and includes a breast shield that audibly attaches to the housing.
- Feature 5      Elvie is wearable and includes a breast shield that attaches to the housing with a single push.
- 25    Feature 6      Elvie is wearable and not top heavy, to ensure comfort and reliable suction against the breast.
- Feature 7      Elvie is wearable and has a Night Mode for convenience.

- Feature 8 Elvie is wearable and includes a haptic or visual indicator showing when milk is flowing or not flowing well.
- Feature 9 Elvie is wearable and collects data to enable the mother to understand what variables (e.g. time of day, pump speed etc.) correlate to good milk-flow.
- 5 Feature 10 Elvie is wearable and collects data that can be exported to social media.
- Feature 11 Elvie is wearable and has a smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.
- 10 Feature 12 A smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.
- Feature 13 Elvie is wearable and includes a sensor to infer the amount of movement or tilt angle during normal use.
- Feature 14 Elvie includes a control to toggle between expressing milk from the left breast and the right breast.
- 15 Feature 15 Elvie includes a pressure sensor.
- Feature 16 Elvie includes a microcontroller to enable fine tuning between pre-set pressure profiles.
- Feature 17 Elvie enables a user to set the comfort level they are experiencing.
- 20 Feature 18 Elvie includes a microcontroller to dynamically and automatically alter pump operational parameters.
- Feature 19 Elvie automatically learns the optimal conditions for let-down.

#### **B. Elvie Piezo Air Pump Feature Cluster**

- 25 Feature 20 Elvie is wearable and has a piezo air-pump for quiet operation.
- Feature 21 Elvie has a piezo air-pump and self-sealing diaphragm
- Feature 22 Elvie uses more than one piezo air pump in series.

- Feature 23 Elvie is wearable and has a piezo air-pump, a breast shield and a diaphragm that fits directly onto the breast shield.
- 5 Feature 24 Elvie is wearable and has a piezo air-pump for quiet operation and a re-useable, rigid milk container for convenience.
- Feature 25 Elvie has a piezo-pump for quiet operation and is a connected device.
- Feature 26 Elvie uses a piezo in combination with a heat sink that manages the heat produced by the pump.
- 10 Feature 27 Elvie is wearable and gently massages a mother's breast using small bladders inflated by air from its negative pressure air-pump.
- Feature 28 Elvie is wearable and gently warms a mother's breast using small chambers inflated by warm air from its negative pressure air-pump.

### **C. Elvie Milk Container Feature Cluster**

- 15 Feature 29 Elvie is wearable and includes a re-useable, rigid milk container that forms the lower part of the pump, to fit inside a bra comfortably.
- Feature 30 Elvie is wearable and includes a milk container that latches to the housing with a simple push to latch action.
- 20 Feature 31 Elvie is wearable and includes a removable milk container with an integral milk pouring spout for convenience.
- Feature 32 Elvie is wearable and includes a removable milk container below the milk flow path defined by a breast shield for fast and reliable milk collection.
- 25 Feature 33 Elvie is wearable and includes a breast shield and removable milk container of optically clear, dishwasher safe plastic for ease of use and cleaning.
- Feature 34 Elvie is wearable and includes various components that self-seal under negative air pressure, for convenience of assembly and disassembly.

Feature 35 Elvie is wearable and includes a spout at the front edge of the milk container for easy pouring.

Feature 36 Elvie is wearable and includes a milk container that is shaped with broad shoulders and that can be adapted as a drinking bottle that baby can easily hold.

#### **D. Elvie IR System Feature Cluster**

Feature 37 Elvie is wearable and includes a light-based system that measures the quantity of milk in the container for fast and reliable feedback.

10 Feature 38 The separate IR puck for liquid quantity measurement.

Feature 39 The separate IR puck combined with liquid tilt angle measurement.

#### **E. Bra Clip Feature**

Feature 40 Bra Adjuster.

#### **F. Other Features that can sit outside the breast pump context**

Feature 41 Wearable device using more than one piezo pump connected in series or in parallel.

Feature 42 Wearable medical device using a piezo pump and a heat sink attached together.

We define these features in terms of the device; methods or process steps which correspond to these features or implement the functional requirements of a feature are also covered.

We'll now explore each feature 1 – 42 in depth. Note that each feature can be combined with any other feature; any sub-features described as 'optional' can be combined with any other feature or sub-feature.

5     **A.     Elvie Breast Pump: General Usability Feature Cluster**

**Feature 1     Elvie is wearable and includes only two parts that are removable from the pump main housing in normal use**

A wearable breast pump system including:

- 10     (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b)     a breast shield;
- (c)     a rigid or non-collapsible milk container;

         and in which the breast pump system includes only two parts that are directly removable from the housing in normal use or normal dis-assembly: the breast shield and the rigid,  
15     non-collapsible milk container.

Optional:

- The only parts of the system that come into contact with milk in normal use are the breast shield and the milk container.
- 20     • Milk only flows through the breast shield and then directly into the milk container.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- 25     • The two removable parts are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and nipple tunnel shaped to receive a nipple.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings, in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- No other parts are removable from the breast shield, apart from the flexible diaphragm.
- The milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.
- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.

- No other parts are removable from the milk container, apart from the cap and the valve.
- All parts that are user-removable in normal use are attached to either the breast shield or the milk container.
- 5     • Audible or haptic feedback confirms the pump system is properly assembled for normal use with the milk container locked to the housing and the breast shield locked to the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from  
10     that breast.

**Feature 2     Elvie is wearable and includes a clear breast shield giving an unobstructed view of the breast for easy nipple alignment**

A wearable breast pump system including:

- 15     (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b)     and a breast shield including a substantially transparent nipple tunnel, shaped to receive a nipple, providing to the mother placing the breast shield onto her breast a clear and unobstructed view of the nipple when positioned inside the nipple tunnel, to  
20     facilitate correct nipple alignment.

Optional:

- The breast shield is configured to provide to the mother a clear and unobstructed view of the nipple when the breast shield is completely out, of or separated from, the housing.
- 25     • The breast shield is configured to provide to the mother a clear and unobstructed view of the nipple when the breast shield is partially out of, or partially separated from, the housing.
- Entire breast shield is substantially transparent.
- Breast shield is a one-piece item including a generally convex surface shaped to  
30     fit over a breast.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- A milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.



- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.

5

**Feature 3 Elvie is wearable and includes a clear breast shield with nipple guides for easy breast shield sizing**

A wearable breast pump system including:

10 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;

(b) and a breast shield including a substantially transparent nipple tunnel shaped to receive a nipple, the nipple tunnel including guide lines that define the correct spacing of the nipple from the side walls of the nipple tunnel.

Optional:

- 15
- The guide lines run generally parallel to the sides of the nipple placed within the nipple tunnel.
  - Breast shield is selected by the user from a set of different sizes of breast shield to give the correct spacing.
  - Breast shield is a one-piece item including a generally convex surface shaped to
- 20
- fit over a breast.
  - Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
  - Breast shield is configured to be rotated smoothly around the nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at
- 25
- the top of the breast.
  - Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
  - Breast shield latches into position against the housing.
  - Breast shield latches into position against the housing when spring plungers in
- 30
- the housing locate into small indents in the breast shield.

- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 4      Elvie is wearable and includes a breast shield that audibly attaches to the housing.**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) and a breast shield that is attachable to the housing with a mechanism that latches with an audible click when the breast shield is slid on to or against the housing with sufficient force.

Optional:

- The breast shield is configured to slide onto or against the housing in a direction parallel to the long dimension of a nipple tunnel in the breast shield.

- Breast shield is removable from the housing with an audible click when the breast shield is pulled away from the housing with sufficient force.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast.
- 5      • Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around the nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- 10      • Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- 15      • Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- 20      • The edge of the flexible diaphragm seals, self-seals, self-energising seals, or interference fit seals against the housing when the breast shield attaches to the housing.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- 25      • Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 30      • Nipple tunnel includes on its lower surface an opening through which expressed milk flows.

- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

5     **Feature 5     Elvie is wearable and includes a breast shield that attaches to the housing with a single push**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10   (b) and a breast shield configured to attach to the housing with a single, sliding push action.

Optional:

- The breast shield is configured to slide onto or against the housing in a direction parallel to the long dimension of a nipple tunnel in the breast shield.
- 15   • The single push action overcomes a latching resistance.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- 20   • Breast shield is configured to be rotated smoothly around a nipple inserted into a nipple tunnel in the breast shield to position a diaphragm housing portion of the breast shield at the top of the breast.
- Housing is configured to slide onto the breast shield when the breast shield has been placed onto a breast using guide members.
- 25   • Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when
- 30   negative air pressure is applied to it by an air pump system in the housing, and (b)

transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.

- The edge of the flexible diaphragm seals, self-seals, self-energising seals, or interference fit seals against the housing when the breast shield attaches to the housing.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- A milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.
- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.

**Feature 6      Elvie is wearable and not top heavy, to ensure comfort and reliable suction against the breast**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism

(b) and a breast shield;

(c) a milk container;

and in which the centre of gravity of the pump system is, when the milk container is empty, substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through a nipple tunnel or filling point on a breast shield, so  
5 that the device is not top-heavy for a woman using the pump.

Optional:

- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- 10 • In which the centre of gravity only moves lower during use as the milk container gradually receives milk, which increases the stability of the pump inside the bra.
- In which milk only passes downwards when moving to the milk container, passing through the nipple tunnel and then through an opening in the lower surface of the nipple tunnel directly into the milk container, or components that  
15 are attached to the milk container.
- System is configured so that its centre of gravity is no more than 60mm up from the base of the milk container also below the top of the user's bra cup.
- In which the pumping mechanism and the power supply for that mechanism are positioned within the housing to provide a sufficiently low centre of gravity.
- 20 • In which the pumping mechanism is one or more piezo air pumps, and the low weight of the piezo air pumps enables the centre of gravity to be substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through the nipple tunnel or filling point on the breast shield.
- In which the pumping mechanism is one or more piezo air pumps, and the small size of the piezo air pumps enables the components in the housing to be arranged so that the centre of gravity is substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through the nipple  
25 tunnel or filling point on the breast shield.
- In which the pumping mechanism is one or more piezo air pumps, and the low weight of the battery or batteries needed to power that piezo air pumps enables  
30 the centre of gravity to be substantially at or below (i) the half-way height line of

the housing or (ii) the horizontal line that passes through the nipple tunnel or filling point on the breast shield.

- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

#### **Feature 7 Elvie is wearable and has a Night Mode for convenience**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- 10 (b) an illuminated control panel;
- (c) a control system that reduces or adjusts the level or colour of illumination of the control panel at night or when stipulated by the user.

Optional:

- 15 • The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Control system is implemented in hardware in the pump itself using a 'night mode' button.
- Control system is implemented in software within a connected device app running on the user's smartphone.
- 20 • Control system is linked to the illumination level on a connected device app., so that when the connected app is in 'night mode', the illuminated control panel is also in 'night mode', with a lower level of illumination, and when the illuminated control panel on the housing is in 'night mode', then the connected app is also in 'night mode'.
- 25 • Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast. The pumping mechanism is one or more piezo air pumps, selected for quiet operation.

**Feature 8 Elvie is wearable and includes a haptic or visual indicator showing when milk is flowing or not flowing well**

A wearable breast pump system including:

- 5 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) a milk container that is configured to be concealed within a bra and is hence not visible to the mother in normal use;
- (c) a visual and/or haptic indicator that indicates whether milk is flowing or not flowing into the milk container.
- 10 Optional:
- A haptic and/or visual indicator indicates if the pump is operating correctly to pump milk, based on whether the quantity and/or the height of the liquid in the container above its base is increasing above a threshold rate of increase
  - 15 • The visual indicator is a row of LEDs that changes appearance as the quantity of liquid increases.
  - The haptic and/or visual indicator provides an indication of an estimation of the flow rate.
  - The visual indicator provides a colour-coded indication of an estimation of the flow rate.
  - 20 • The visual indicator provides an indication of how much of the container has been filled.
  - The visual indicator is part of a user interface in a connected, companion application, running on a smartphone or other personal device, such as a smart watch or smart ring.
  - 25 • The haptic indicator is part of a user interface in a connected, companion application, running on a smartphone or other personal device, such as a smart watch or smart ring.
  - A sub-system measures or infers the quantity and/or the height of the liquid in the container.
  - 30 • The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect



light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.

- Sub-system includes or communicates with an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- A sub-system measures or infers the angle the top surface of the liquid in the container makes with respect to a baseline, such as the horizontal.
- A haptic and/or visual indicator indicates if the amount of milk in the milk container has reached a preset quantity or level.
- A haptic and/or visual indicator indicates if there is too much movement of the breast pump system for viable operation.
- Milk container is attached to the lower part of the housing and forms the base of the breast pump system.
- Milk container is made of transparent material.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 9 Elvie is wearable and collects data to enable the mother to understand what variables (e.g. time of day, pump speed etc.) correlate to good milk-flow**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- (b) a milk container;
- (c) a measurement sub-system that measures or infers milk flow into the milk container;

and in which the measurement sub-system provides data to a data analysis system that determines metrics that correlate with user-defined requirements for milk-flow rate or milk expression.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- User-defined requirement is to enhance or increase milk-flow.
- 5      • User-defined requirement is to reduce milk-flow.
- The data analysis system analyses data such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- 10      • The data analysis system determines metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level, peak negative air pressure or vacuum level, pump cycle time or frequency, changing profile of pump speed over a single pumping session time of day.
- 15      • The data analysis system determines metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely matches.
- 20      • Data analysis system is local to the breast pump system, or runs on a connected device, such as a smartphone, or is on a remote server or is on the cloud, or is any combination of these.
- measurement sub-system measures or infers the quantity and/or the height of the liquid in the container above its base.
- 25      • Measurement sub-system measures or infers angle the top surface of the liquid in the container makes with respect to a baseline, such as the horizontal.
- Data analysis system gives recommended metrics for improving milk flow
- Data analysis system gives recommended metrics for weaning.
- 30      • Data analysis system gives recommended metrics for increasing milk supply (e.g. power pumping).
- Data analysis system gives recommended metrics if an optimal session start time or a complete session has been missed.

- Data analysis system leads to automatic setting of metrics for the pumping mechanism, such as pump speed, length of a single pumping session, vacuum level, cycle times, changing profile of pump speed over a single pumping session.
- 5 • Data analysis system enables sharing across large numbers of connected devices or apps information that in turn optimizes the milk pumping or milk weaning efficacy of the breast pump.
- Metrics include the specific usage of the connected device by a woman while using the pump (for example by the detection of vision and/or audio cues).
- 10 • The measurement sub-system measures or infers the quantity and/or the height of the liquid in the container.
- The measurement sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.
- 15 • The measurement sub-system includes or communicates with an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the measurement sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- 20 • Milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

25

**Feature 10 Elvie is wearable and collects data that can be exported to social media.**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- 30 (b) a milk container;

(c) a data sub-system that collects and provides data to a connected device or remote application or remote server;

(d) and in which the collected data, in whole or in part, is used by a data analysis system that provides inputs to a social media or community function or platform.

5 Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- The data analysis system analyses metrics such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over  
10 one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- The data analysis system analyses metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level, peak negative air pressure or vacuum level, pump cycle time or frequency,  
15 changing profile of pump speed over a single pumping session time of day.
- The data analysis system analyses metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely  
20 matches.
- Data analysis system is local to the breast pump system, or runs on a connected device, such as a smartphone, or is on a remote server or is on the cloud, or is any combination of these.
- The social media or community function or platform organizes the collected data  
25 into different profiles.
- The social media or community function or platform enables a user to select a matching profile from a set of potential profiles.
- each profile is associated with a specific kind of milk expression profile, and provides information or advice that is specifically relevant to each milk  
30 expression profile.
- Information or advice includes advice on how to increase milk expression by varying parameters, such as time of milk expression, frequency of a milk

expression session, pump speed, length of a single pumping session, vacuum level, cycle times, changing profile of pump speed over a single pumping session and any other parameter that can be varied by a mother to help her achieve her milk expression goals.

- 5       • The application is connected to other applications residing on the connected device, such as a fitness app.
- The collected data includes data received from other connected apps.
- The collected data is anonymised before it is shared.
- The sub-system includes a wi-fi connectivity component for direct connectivity
- 10       to a remote server.
- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies
- negative pressure to a region surrounding a woman's breast to pump milk from
- 15       that breast.

**Feature 11 Elvie is wearable and has a smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh**

A breast pump system including a pumping mechanism and a milk container and

20       including:

- (a) a housing including the pumping mechanism;
- (b) a milk container;
- (c) and in which the milk container or any associated part, such as a lid, includes a memory or tag that is automatically programmed to store the time and/or date it was
- 25       filled with milk.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Memory or tag is programmed to store the quantity of milk in the milk container.
- 30       • Memory or tag stores the milk expiry date.

- Memory or tag stores a record of the temperature of the milk or the ambient temperature around the milk, and calculates an expiry date using that temperature record.
- System includes a clock and writes the time and/or date the milk container was filled with milk to the memory or tag on the milk container.
- Clock is in the housing.
- Clock is in the milk container.
- Milk container includes a display that shows the time and/or date it was filled with milk.
- Milk container includes a display that shows the quantity of milk that it was last filled with milk.
- Milk container includes a display that shows whether the left or right breast was used to fill the milk container.
- Memory or tag is connected to a data communications sub-system.
- Memory or tag is a remotely readable memory or tag, such as a NFC tag, enabling a user to scan the milk container with a reader device, such as a smartphone, and have the time and/or date that container was filled with milk, displayed on the reader device.
- Reader device shows the time and/or date a specific milk container was filled with milk.
- Reader device shows the quantity of milk that a specific milk container was last filled with.
- Reader device shows the time and/or date and/or quantity that each of several different milk containers were filled with.
- Reader device shows whether the left or right breast was used to fill the milk contained in a specific milk container.
- A sub-system measures or infers milk flow into the milk container.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.

- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/Tr the height of the liquid in the container.
- The sub-system is in the housing.
- 5 • Milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk form that breast.

10

**Feature 12 A smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.**

A smart bottle or container that includes or is associated with a memory or a tag that is programmed to store the date and time it is filled using data from a pump or a connected  
15 device, such as a smartphone.

Optional:

- The container includes wireless connectivity and connects to a companion app.
- The memory or tag includes an NFC chip and is read using a NFC reader.
- The memory or tag stores also an expiry date.
- 20 • Memory or tag stores a record of the temperature of the milk or the ambient temperature around the milk, and calculates an expiry date using that temperature record.
- The memory or tag stores also the quantity of milk stored.
- System includes a clock and writes the time and/or date the milk container was  
25 filled with milk to the memory or tag on the milk container.
- Clock is in the housing.
- Clock is in the container.
- Milk container includes a display that shows the time and/or date it was filled with milk.
- 30 • Milk container includes a display that shows the quantity of milk that it was last filled with milk.

- Milk container includes a display that shows whether the left or right breast was used to fill the milk contained.
- Milk container includes a display that shows the expiry date.
- memory or tag is connected to a data communications sub-system.
- 5 • Memory or tag is a remotely readable memory or tag, such as a NFC tag, enabling a user to scan the milk container with a reader device, such as a smartphone.
- Reader device shows the time and/or date a specific milk container was filled with milk.
- Reader device shows the quantity of milk that a specific milk container was last  
10 filled with.
- Reader device shows the time and/or date and/or quantity that each of several different containers were filled with.
- Reader device shows whether the left or right breast was used to fill the milk contained in a specific milk container.
- 15 • Reader device shows the expiry date.
- Container includes wireless connectivity and connects to a companion application.
- An application tracks status of one or more smart containers and enables a user to select an appropriate smart container for a feeding session.
- 20 • The pump is wearable.
- The pump is in a housing shaped to fit inside a bra and the container is a milk container that is connected to the housing and is positioned to form the base of the housing.
- Container is used for liquids other than milk.

25

**Feature 13 Elvie is wearable and includes a sensor to infer the amount of movement or tilt angle during normal use.**

A breast pump system including:

- (a) a housing;
- 30 (b) a milk container;



(c) the housing including a sensor, such as an accelerometer, that measures or determines the movement and/or tilt angle of the housing, during a pumping session and automatically affects or adjusts the operation of the system depending on the output of the sensor.

5 Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- If the tilt angle of the housing exceeds a threshold, then the system automatically affects the operation of the system by warning or alerting the mother of a potential imminent spillage (e.g. from milk flowing back out of a breast shield) using an audio, or visual or haptic alert, or a combination of audio, haptic and visual alerts.
- If the tilt angle of the housing exceeds a threshold, then the system automatically adjusts the operation of the system by stopping the pump to prevent spillage.
- When the tilt angle of the housing reduces below the threshold, the system automatically adjusts the operation of the system by causing pumping to resume automatically.
- If the tilt angle of the housing exceeds a threshold, then the system automatically affects the operation of the system by providing the mother with an alert to change position.
- The container includes an optically clear region.
- There are one or more light emitters and detectors positioned in the base of the housing, the light emitters and receivers operating as part of a sub-system that measures or infers the tilt angle of the milk in the container.
- The sub-system measures the quantity of liquid in the milk container and also takes the measured tilt angle of the housing into account.
- If the tilt angle is above a certain threshold, the system ignores the quantity of liquid measured.
- The sub-system derives or infers the mother's activity, such as walking, standing or lying activities, from the sensor.
- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.

- Sub-system stores a time-stamped record of movement and/or tilt angles of the housing in association with milk flow data.
- System includes a breast shield that attaches to the housing.
- System includes a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 14 Elvie includes a control to toggle between recording whether milk is being expressed from the left breast and the right breast.**

10 A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a control interface that the user can select to indicate or record if milk is being expressed from the left or the right breast.

Optional:

- 15 • Control interface is a physical interface on the housing.
- Control interface is a single button on the housing.
- Control interface is from an application running on a device, such as a smartphone or smart ring.
- Visual indicators on the housing indicate whether the breast pump system is being set up the left or the right breast.
- 20 • The visual indicator for the left breast is on the right-hand side of the housing, when viewed from the front; and the visual indicator for the right breast is on the left-hand side of the housing, when viewed from the front.
- The housing includes a button labeled to indicate the left breast and a button labeled to indicate the right breast, that are respectively illuminated to indicate from which breast the milk is being expressed.
- 25 • Breast pump system is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

30

**Feature 15 Elvie includes a pressure sensor.**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) an air pressure sensor configured to measure the negative pressure delivered by the negative air-pressure mechanism and (iii) a measurement sub-system that  
5 measures or infers milk flow or milk volume.

Optional:

- The system also includes a control sub-system that combines or relates the air-pressure measurements with the milk flow or milk volume measurements
- 10 • The control sub-system automatically adjusts the negative air-pressure to give the optimal milk flow or milk volume.
- The control sub-system automatically adjusts the negative air-pressure during a pumping session to give the optimal milk flow or milk volume within comfort constraints defined by the user.
- 15 • The air pressure sensor detects pressure created by the pumping mechanism.
- Sensor is a piezo air pressure sensor
- Air pressure sensor measures the negative air pressure during a normal milk expression session.
- Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to vary the operation of the pumping  
20 mechanism so that it deliver consistent performance over time.
- Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to vary the operation of the pumping mechanism so that different pumping mechanisms in different breast pump systems all deliver consistent performance
- 25 • Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to determine if the pumping mechanism is working correctly, within tolerance levels.
- The operation of the pumping mechanism is varied by altering the duty or pump cycle.
- 30 • The operation of the pumping mechanism is varied by altering the voltage applied to the pumping mechanism.
- Pumping mechanism is a piezo air pump.

- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 16 Elvie includes a microcontroller to enable fine tuning between pre-set pressure profiles**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to cause the pumping mechanism to deliver various pre-set pressure profiles and to permit the user to manually vary the pressure to a value or values that are in-between the values available from a pre-set pressure profile.

Optional:

- The user manually varies the pressure using a control interface on a housing of the breast pump system
- The user manually varies the pressure using a control interface on an application running on a wireless device such as a smartphone that is wirelessly connected to the breast pump system.
- The user manually varies the pressure by altering a control parameter of the pumping mechanism.
- The user manually varies the pressure by altering the duty cycle or timing of the

pumping mechanism.

- The user manually varies the pressure by altering the voltage applied to the pumping mechanism.
- The system includes an air pressure sensor configured to measure the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Pressure profile defines one or more maximum negative air pressure levels.
- Pressure profile defines one or more maximum negative air pressure levels, each for a pre-set time.
- Pressure profile defines one or more cycle time.
- Pressure profile defines peak flow rate.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 17 Elvie enables a user to set the comfort level they are experiencing**

- 30 A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to control the pumping mechanism and to permit the user to manually indicate the level of comfort that they are experiencing when the system is in use.

Optional:

- The user manually indicates the level of comfort that they are experiencing using a touch or voice-based interface on a housing of the breast pump system
- 5 • The user manually indicate the level of comfort that they are experiencing using a touch or voice-based interface on an application running on a wireless device, such as a smartphone, that is wirelessly connected to the breast pump system.
- The system stores user-indicated comfort levels together with associated parameters of the pumping system.
- 10 • The system is a connected device and a remote server stores user-indicated comfort levels together with associated parameters of the pumping system.
- The parameters of the pumping system include one or more of: pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing cycle of the pumping mechanism.
- 15 • System automatically varies parameters of the pumping system and then enables the user to indicate which parameters are acceptable.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- 20 • Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- 25 • Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- 30 • The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the

intensity of the light from the emitters that has been reflected from the surface of the milk.

5     **Feature 18     Elvie includes a microcontroller to dynamically and automatically alter pump operational parameters**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to automatically change one or more parameters of the pumping mechanism, and to automatically measure or relate milk  
10     expression data as a function of different values of one or more of these parameters.

Optional:

- 15     • The milk expression data includes one or more of the following: milk expression rate or quantity; comfort; optimal pumping mode; optimal pumping mode given remaining battery power.
- The system automatically calculates or identifies the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity and uses that set of parameters.
- 20     • The system automatically calculates or identifies the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity and uses that set of parameters if the comfort experienced by the user when those parameters are used is above a threshold.
- The system displays the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity to the user.
- 25     • The system displays the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity to the user and enables the user to manually select those parameters if they are acceptable.
- Parameters of the pumping mechanism includes pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing  
30     cycle of the pumping mechanism.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.

- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 19 Elvie automatically learns the optimal conditions for let-down**

- A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to dynamically change one or more parameters of the pumping mechanism, and to automatically detect the start of milk let-down.
- Optional:
- The microcontroller is programmed to dynamically change one or more parameters of the pumping mechanism, to enable it to learn or optimize the parameters relating to milk let-down.
  - The system automatically calculates or identifies or learns the parameters of the pumping mechanism that correlate with the quickest start of milk let-down.
  - The system automatically calculates or identifies or learns the parameters of the pumping mechanism that correlate with the quickest start of milk let-down and uses that set of parameters if the comfort experienced by the user when those



parameters are used is above a threshold or are otherwise acceptable to the user.

- The system displays the parameters of the pumping mechanism that correlate with the quickest start of milk let-down to the user.
- The system displays the parameters of the pumping mechanism that correlate with the quickest start of milk let-down and enables the user to manually select those parameters if they are acceptable.
- parameters of the pumping mechanism includes pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing cycle of the pumping mechanism.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

## **B. Elvie Piezo Air Pump Feature Cluster**

### **Feature 20 Elvie is wearable and has a piezo air-pump for quiet operation**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a piezo air-pump in the housing that is part of a closed loop system that drives, a separate, deformable diaphragm to generate negative air pressure.

Optional:

- 5
  - The deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
  - Piezo air pump is positioned at or close to the base of the housing.
  - There are two or more piezo air pumps.
  - There are two or more piezo air pumps mounted in a series arrangement.
- 10
  - There are two or more piezo air pumps mounted in a parallel arrangement.
  - The closed system is separated from a 'milk' side by a flexible diaphragm.
  - Deformable diaphragm is removably mounted against a part of a breast shield.
  - Deformable diaphragm is a unitary or one-piece object that is removably mounted against a part of a breast shield.
- 15
  - Deformable diaphragm is not physically connected to the piezo air-pump.
  - Piezo air-pump is a closed loop air-pump that drives a physically separate and remote deformable diaphragm that removably fits directly onto the breast shield
  - Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- 20
  - Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 25
  - The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
  - The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
  - In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- 30
  - In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.

- The piezo pump is fed by air that passes through an air filter.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

5

**Feature 21 Elvie has a piezo air-pump and self-sealing diaphragm**

A breast pump system including:

- (a) a housing;
- (b) a piezo air-pump in the housing that is part of a closed loop system that drives, a physically separate, deformable, self-sealing diaphragm, to generate negative air pressure.

10

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Piezo air pump is positioned at or close to the base of the housing.
- 15 • There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement .
- The closed system is separated from a 'milk' side by the flexible diaphragm.
- Deformable diaphragm is removably mounted against a part of a breast shield.
- 20 • Deformable diaphragm is a unitary or one-piece object that is removably mounted against a part of a breast shield.
- Deformable diaphragm is not physically connected to the piezo air-pump.
- Piezo air-pump is a closed loop air-pump that drives a physically separate and remote deformable diaphragm that removably fits directly onto the breast shield.
- 25 • Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing,

and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.

- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- 5      • The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- 10      • The piezo pump is fed by air that passes through an air filter.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

#### 15      **Feature 22      Elvie uses more than one piezo air pump in series**

A breast pump system including:

- (a)      a housing;
- (b)      multiple piezo air-pumps in the housing that drives a deformable diaphragm inside the housing to generate negative air pressure; in which the multiple piezo air-
- 20      pumps can be operated at different times in series-connected and in parallel-connected modes.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- 25      • Parallel connected mode is used during a first part of a pumping cycle to reach a defined negative air pressure more quickly than series connected mode would, and then the system switches to a series connected mode to reach a greater negative air pressure than series connected mode can reach.
- An actuator switches the system from parallel-connected piezo pump mode to
- 30      series-connected piezo pump mode.

- Each piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- Each piezo air pump weighs less than 10 gm, and may weigh less than 6gm..
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- Each piezo pump is fed by air that passes through an air filter.
- Each piezo air pump forms part of a closed or closed loop system.
- Each piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- The piezo-air pumps are a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.

**Feature 23 Elvie is wearable and has a piezo air-pump, a breast shield and a diaphragm that fits directly onto the breast shield**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a breast shield that attaches to the housing;
- (b) a piezo air-pump in the housing that drives a deformable diaphragm that fits directly onto the breast shield.

Optional:

- Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Deformable diaphragm is removable from the diaphragm housing for cleaning.

- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.
- Piezo air pump is position at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise. The piezo pump is fed by air that passes through an air filter.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.

**Feature 24 Elvie is wearable and has a piezo air-pump for quiet operation and a re-useable, rigid milk container for convenience**

- 15 A wearable breast pump system including:
- (a) a housing shaped at least in part to fit inside a bra;
  - (b) a piezo air-pump in the housing;
  - (c) and a re-useable, rigid or non-collapsible milk container that when connected to the housing forms an integral part of the housing and that is also removable from the housing.

Optional:

- Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The closed system is separated from a 'milk' side by a flexible diaphragm.

- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.
- The deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- The deformable diaphragm is removable from the diaphragm housing for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk pouches.



**Feature 25 Elvie has a piezo-pump for quiet operation and is a connected device**

A breast pump system including

- (a) a housing;
- 5 (b) a piezo air-pump in the housing;
- (c) a milk container;
- (d) a data connectivity module that enables data collection relating to the operation of the piezo air-pump and transmission of that data to a data analysis system.

Optional:

- 10 • The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Transmission is to an application running on a connected device such as a smartphone, or a server, or the cloud.
- The data collection and transmission relates to any other operational data of the
- 15 system.
- Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- 20 • There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a
- 25 physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.
- The closed system is separated from a 'milk' side by a flexible diaphragm.
- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.

- The deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Deformable diaphragm is removable from the diaphragm housing for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- A sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with the data connectivity module.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.
- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- The data analysis system analyses metrics such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- The data analysis system analyses metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level,

peak negative air pressure or vacuum level, pump cycle time or frequency, changing profile of pump speed over a single pumping session time of day.

- The data analysis system analyses metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely matches.

**Feature 26 Elvie uses a piezo in combination with a heat sink that manages the heat produced by the pump.**

A breast pump system including:

- (a) a housing;
- (b) a piezo air-pump in the housing that drives a deformable diaphragm inside the housing to generate negative air pressure;
- (c) a heat sink to manage the heat produced by the piezo-air pump to ensure it can be worn comfortably.

Optional:

- The heat sink is configured to ensure that the maximum temperature of any parts of the breast pump system that might come into contact with the skin, especially prolonged contact for greater than 1 minute, are no more than 48°C and preferably no more than 43°C.
- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Heat sink is connected to an air exhaust so that air warmed by the piezo pumps vents to the atmosphere.
- Heat sink warms a breast shield.
- Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.

- There are two or more piezo air pumps, each connected to its own or a shared heat sink.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- 5 • The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably  
10 fits directly onto the breast shield.
- The closed system is separated from a 'milk' side by a flexible diaphragm.
- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
- The deformable diaphragm is a flexible generally circular diaphragm that sits over  
15 a diaphragm housing that is an integral part of a breast shield.
- The deformable diaphragm is removable from the diaphragm housing for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the  
20 diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- 25 • The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- 30 • In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.

**Feature 27 Elvie is wearable and gently massages a mother's breast using small bladders inflated by air from its negative pressure air-pump**

A breast pump system including:

- (a) a housing;
- 5 (b) an air-pump in the housing that drives a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast;
- (c) in which the air pump also provides air to regularly or sequentially inflate one or more air bladders or liners that are configured to massage one or more parts of the
- 10 breast.

Optional:

- Air-pump is a piezo pump.
- Breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- 15 • Bladders or liners are formed in a breast shield that attaches to the housing.

**Feature 28 Elvie is wearable and gently warms a mother's breast using small chambers inflated by warm air from its negative pressure air-pump**

A breast pump system including:

- 20 (a) a housing;
- (b) an air-pump, such as a piezo pump, in the housing that drive a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast;
- (c) in which the air pump also provides warm air to regularly or sequentially inflate
- 25 one or more air chambers that are configured to apply warmth to one or more parts of the breast.

Optional:

- Breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- The air chamber is a deformable diaphragm positioned on a breast shield that attaches to the housing.

5

### C. Elvie Milk Container Feature Cluster

#### **Feature 29 Elvie is wearable and includes a re-useable, rigid milk container that forms the lower part of the pump, to fit inside a bra comfortably**

10 A wearable breast pump system configured including:

(a) a housing shaped at least in part with a curved surface to fit inside a bra and including a pumping mechanism;

(b) and a re-useable rigid or non-collapsible milk container that when connected to the housing forms an integral, lower part of the housing, with a surface shaped to  
 15 continue the curved shape of the housing, so that the pump system can be held comfortably inside the bra.

Optional:

- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- 20 • The milk container is attached to the housing with a push action.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk  
 25 pouches.
- The milk container includes an aperture, spout or lid that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the  
 30 negative air-pressure from the pumping mechanism against an opening in a

breast shield, and milk flows under gravity through the opening into the milk container.

- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump mechanism to ensure that negative air-pressure is not applied to the milk container.
- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 30 Elvie is wearable and includes a milk container that latches to the housing with a simple push to latch action**

A wearable breast pump system including:

(a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;

(b) and a milk container that is attachable to the housing with a mechanism that releasably attaches or latches when the milk container is sufficiently pressed on to the housing with a single push action.

Optional:

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- Milk container, when connected to the housing, forms an integral, lower part of the housing and that is removable from the housing with a release mechanism that can be operated with one hand.

- Mechanism that releasably attaches or latches is a mechanical or magnetic mechanism.
- Mechanical mechanism includes flanges on the top of the milk container, or the sealing plate that seals the opening to the milk contained, that engage with and move past a surface to occupy a latched position over that surface when the milk container is pressed against the housing to lock into the housing.
- The housing includes a button that when pressed releases the milk container from the housing by flexing the surface away from the flanges so that the flanges no longer engage with and latch against the surface.
- Mechanism that attaches or latches the milk container into position does so with an audible click.
- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing by releasing the latch and moving the housing off the milk container.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.



- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

5     **Feature 31     Elvie is wearable and includes a removable milk container with an integral milk pouring spout for convenience**

A wearable breast pump system including:

- (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10    (b)     and a re-useable milk container that is connected to the housing with a surface shaped to continue the curved or breast-like shape of the pump, so that the pump can be held comfortably inside a bra and where the milk container includes a pouring spout for pouring milk.

Optional:

- 15     • Spout is integral to the milk container.
- Spout is integral to a removable lid to the milk container.
- Spout is positioned at or close to the front edge of the milk container.
- Spout is removable from the container, such as by clipping off the container.
- A teat is attachable to the spout.
- 20     • A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.
- The milk container forms the base of the system.
- 25     • The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.

- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 32 Elvie is wearable and includes a removable milk container below the milk flow path defined by a breast shield for fast and reliable milk collection**

A wearable breast pump system including:

- (a) a housing including a pumping mechanism, the housing being shaped at least in part to fit inside a bra;
- (b) and a breast shield including a nipple tunnel shaped to receive a nipple, and including an opening that defines the start of a milk flow path;
- (c) a re-useable milk container that when connected to the housing is positioned entirely below the opening or the milk flow path, when the breast pump is positioned or oriented for normal use.

Optional:

- The milk container includes an aperture that sits directly underneath the opening in the nipple tunnel in the breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- 5 • Milk flows from the opening directly into the milk container.
- Milk flows from the opening directly into the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against the opening in the breast shield, and milk flows under gravity through the opening into the milk  
10 container.
- Milk flows from the opening directly onto a valve that is attached to the milk container, the valve closing whilst there is sufficient negative air pressure in the volume of air between the valve and the breast shield opening, and then opening to release the milk into the container when the air pressure rises sufficiently.
- 15 • Milk flows from the opening directly onto a valve that is attached to a spout, that is in turn attached to the milk container.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- 20 • A flexible rubber or elastomeric valve is mounted onto the milk container cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container, and milk flows towards and is retained by the duck bill valve whilst the valve is closed, and flows past the  
25 valve into the milk container when the negative air pressure is released and the valve opens.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched  
30 engagement with the housing.
- The two removable parts are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.

- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- 5 • Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has  
10 been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

15

**Feature 33 Elvie is wearable and includes a breast shield and removable milk container of optically clear, dishwasher safe plastic for ease of use and cleaning**

20 A breast pump system including:

- (a) a housing including a pumping mechanism;
- (b) and a breast shield defining a region shaped to receive a nipple, the region defining the start of a milk flow path;
- (c) a re-useable, rigid or non-collapsible milk container that when connected to the  
25 housing is positioned to form the base of the housing;

and in which the breast shield and the milk container are made substantially of an optically clear, dishwasher safe material.

Optional:

- The material is a polycarbonate material, such as Tritan™.

- breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- 5 • Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- 10 • Breast shield operates with a flexible diaphragm that flexes when negative air pressure is applied to it by an air pump system in the housing, and transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- 15 • Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 20 • The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- 25 • The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- 30 • Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

**Feature 34 Elvie is wearable and includes various components that self-seal under negative air pressure, for convenience of assembly and disassembly**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including an air pumping mechanism;
- (b) a breast shield;
- (c) a diaphragm that flexes in response to changes in air pressure caused by the air pumping mechanism and that seals to the breast shield;
- (d) a re-useable milk container that seals to the breast shield;

and in which either or both of the diaphragm and the re-useable milk container substantially self-seal under the negative air pressure provided by the pumping mechanism.

Optional:

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a

breast shield, and milk flows under gravity through the opening into the milk container.

- 5       • The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals against the conduit under the negative air pressure provided by the pumping mechanism.
- 10       • The 1 way valve is attached to the milk container, or a lid or spout of the milk container with an interference fit and is readily removed in normal use for separate cleaning.
- 15       • The diaphragm partly or wholly self-seals to the breast shield under the negative air pressure provided by the pumping mechanism.
- The diaphragm partly or wholly self-seals to the housing under the negative air pressure provided by the pumping mechanism.
- 20       • The diaphragm is attached to the diaphragm housing using elastomeric or rubber latches and is readily removed in normal use for separate cleaning.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- 25       • Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- 30       • Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.

- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

5     **Feature 35     Elvie is wearable and includes a spout at the front edge of the milk container for easy pouring**

A wearable breast pump system configured as a single unit and including:

- (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10     (b)     and a milk container that forms an integral part of the housing;
- (c)     a re-useable pouring spout that is positioned at or close to the front edge of the milk container.

Optional:

- 15     • Milk container is a multifunctional bottle, operating as both a storage container to contain milk that is being expressed, as well as a refrigeratable and freezable storage bottle for that milk, as well as a bottle from which that milk can be drunk by a baby.
- Spout is integral to a removable lid to the milk container.
- Spout is removable from the container, such as by clipping off the container.
- 20     • A teat is attachable to the spout.
- By placing the spout at or close to the front edge of the milk container, the milk container fully empties more readily than where the spout is placed in the middle of the lid of a milk container.
- The spout sits generally under an opening in the breast shield spout or nipple tunnel through which expressed milk flows.
- 25     • The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals against the conduit under the negative air pressure provided by the pumping mechanism.
- 30



- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.

5

**Feature 36 Elvie is wearable and includes a milk container that is shaped with broad shoulders and that can be adapted as a drinking bottle that baby can easily hold**

A wearable breast pump system configured as a single unit and including:

- 10 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) a breast shield;
- (c) a milk container that is removable from the housing and is shaped or configured to also serve as a drinking bottle that is readily held by a baby because it is wider than it is
- 15 tall.

Optional:

- Teat is attachable directly to the milk container.
- Pouring or drinking spout is integral to the milk container.
- The shoulders are at least 2cm in width, and the neck is no more than 1 cm in
- 20 height, to enable a baby to readily grip and hold the container when feeding from the milk in the container.
- Spout/teat/straw resides near the edge of the container's rim.
- Milk container is a multifunctional bottle, operating as both a storage container to contain milk that is being expressed, as well as a refrigeratable and freezable
- 25 storage bottle for that milk, as well as a bottle from which that milk can be drunk by a baby.
- The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals

against the conduit under the negative air pressure provided by the pumping mechanism.

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- Spout is integral to the milk container.
- Spout is integral to a removable lid to the milk container.
- Spout is positioned at or close to the front edge of the milk container.
- Spout is removable from the container, such as by clipping off the container.
- A teat is attachable to the spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.
- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.

**D. Elvie IR System Feature Cluster****Feature 37 Elvie is wearable and includes a light-based system that measures the quantity of milk in the container for fast and reliable feedback**

5 A system for milk volume determination, for use as part of a breast pump, or breast milk collecting device, including:

- (a) a re-useable rigid or non-collapsible milk container;
- (b) at least one light emitter, configured to direct radiation towards the surface of the milk;
- 10 (c) at least one light detector, configured to detect reflected radiation from the surface of the milk;

wherein the light emitters and detectors operate as part of a sub-system that measures the height of, or infers the quantity of, the milk in the container.

Optional:

The wearable breast pump system includes:

- 15 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) and a breast shield;
- (c) a re-useable rigid or non-collapsible milk container that when connected to the housing is positioned to form the base of the housing;

20 and in which the top of the container includes an optically clear region that is aligned below one or more light emitters positioned in the base of the housing.

- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.
- 25 • Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.

- The sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with a data connectivity module.
- Where the quantity or level exceeds a threshold, then the pumping mechanism automatically changes mode, e.g. from a stimulation mode to an expression mode.
- Where the quantity or level exceeds a threshold, then the pumping mechanism automatically stops.
- Milk-flow data is captured and stored.
- If milk-flow falls below a threshold, then a notification is provided to the mother.

### **Feature 38 The separate IR puck for liquid quantity measurement**

A liquid-level measuring system for measuring the quantity of liquid in a container for a breast pump; the system including:

- (a) one or more light emitters directing light at the surface of the liquid in the container;
- (b) one or more light receivers configured to detect light from the light emitters that has been reflected from the liquid;
- (c) a sub-system that infers, measures or calculates the quantity in the liquid using measured properties of the detected light;
- (d) a collar or other fixing system that positions the system over the container.

Optional:

- The quantity of milk is measured as milk enters the container or as milk is removed from the container.
- Measured property includes the reflected light intensity

### **Feature 39 The separate IR puck combined with liquid tilt angle measurement**

A liquid-level measuring system for measuring the tilt angle of liquid in a container; the system including:

(a) one or more light emitters directing light at the surface of the liquid in the container;

(b) one or more light receivers configured to measure properties of the light reflected from the liquid;

5 (c) a sub-system including an accelerometer that infers, measures or calculates the tilt angle of the liquid using measured properties of the detected light;

(d) a collar or other fixing system that positions the system over the container.

Optional:

- Measured property includes the reflected light intensity
- 10 • The quantity of liquid is measured as liquid enters the container or as liquid is removed from the container.
- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- 15 • The sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with a data connectivity module.

#### **Generally applicable optional features**

- Weight of the entire unit, unfilled, is under 250g and preferably 214g.
- 20 • Silver based bactericide is used on all parts that are not steam or heat sterilized in normal cleaning.
- Housing includes a rechargeable battery.
- System is self-contained.
- System is a closed loop system.
- 25 • Breast pump system is a self-contained, wearable device that includes an integral rechargeable battery, control electronics, and one or more air pumps operating as a closed system, driving a flexible diaphragm that in turn delivers negative air-pressure to the breast, to cause milk to be expressed.
- Housing has a generally rounded or convex front surface and has a generally tear-drop shape when seen from the front.
- 30

**E. Bra Clip Feature Cluster****Feature 40 Bra Adjuster**

5 A bra adjuster for a nursing or maternity bra, the nursing or maternity bra including a bra cup with a flap that can be undone to expose the nipple, and the flap attaching to the shoulder strap using a clasp, hook or other fastener attached to the flap, and a corresponding fastener attached to the shoulder strap;

10 and in which the bra adjuster is attachable at one end to the fastener attached to the flap, and at its other end to the fastener attached to the shoulder strap, and hence increases the effective bra cup size sufficiently to accommodate a wearable breast pump, and is also detachable from the flap and shoulder strap.

Optional:

- 15 • Bra adjuster is retained in position on the bra during normal wearing of the bra, even when the flap is attached directly to the shoulder strap, and is used to increases the effective bra cup size only when the wearable breast pump is used.
- Bra adjuster is extensible or elastic.
- Bra adjuster is of a fixed length.
- 20 • Bra adjuster includes a clip that the user can slide onto the bra strap to secure the bra adjuster in position.
- Bra adjuster is machine-washing washable.

**F. Other Features that can sit outside the breast pump context**

25 **Feature 41 Wearable device using more than one piezo pump connected in series or in parallel**

A wearable device including multiple piezo pumps mounted together either in series or in parallel.

Optional:

- The wearable device is a medical wearable device.
- The piezo pumps air or any liquid etc.
- The system can switch between a parallel mode and a series mode to arrive to lower or higher pressure quicker.

5

**Feature 42    Wearable medical device using a piezo pump and a heat sink attached together.**

A wearable medical device including a piezo pump and a heat sink attached together.

Optional

- 10        • The wearable device uses more than one piezo pump connected in series.
- The wearable device uses more than one piezo pump connected in parallel.
- Each piezo pump is connected to its own heat sink, or to a common heat sink.
- The or each heat sink is configured to ensure that the maximum temperature of  
15        any parts of the breast pump system that might come into contact with the skin,  
            especially prolonged contact for greater than 1 minute, are no more than 48°C  
            and preferably no more than 43°C
- The wearable device includes a thermal cut out.
- Excess heat is diverted to a specific location on the device that is selected to not  
            be in prolonged contact with the skin of the user, in normal use.
- 20        • Use cases application:
  - Wound therapy
  - High degree burns
  - Sleep apnea
  - Deep vein thrombosis
  - 25        ○ Sports injury.
- Wearable medical device is powered/charged via USB.

**Note**

It is to be understood that the above-referenced arrangements are only illustrative of the  
30        application for the principles of the present invention. Numerous modifications and  
            alternative arrangements can be devised without departing from the spirit and scope of

the present invention. While the present invention has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred example(s) of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications can be made  
5 without departing from the principles and concepts of the invention as set forth herein.



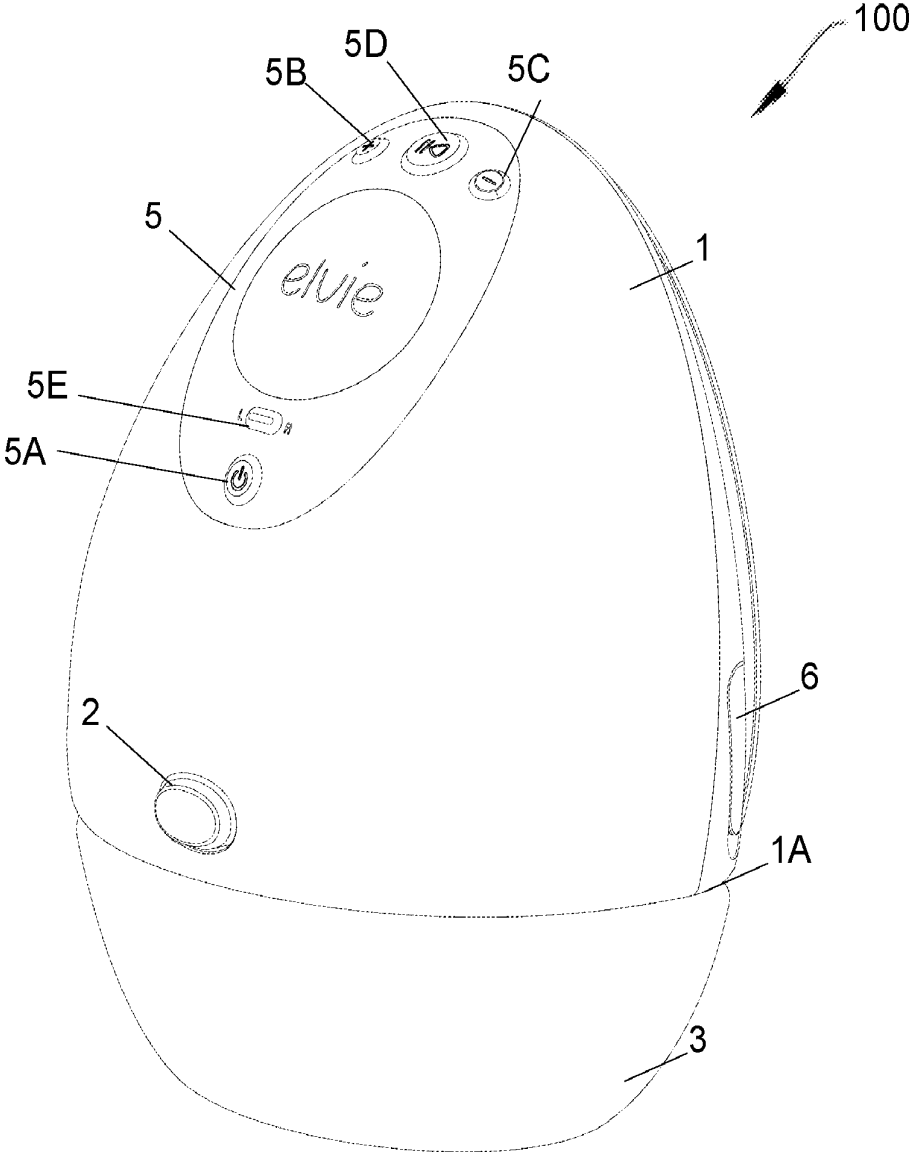
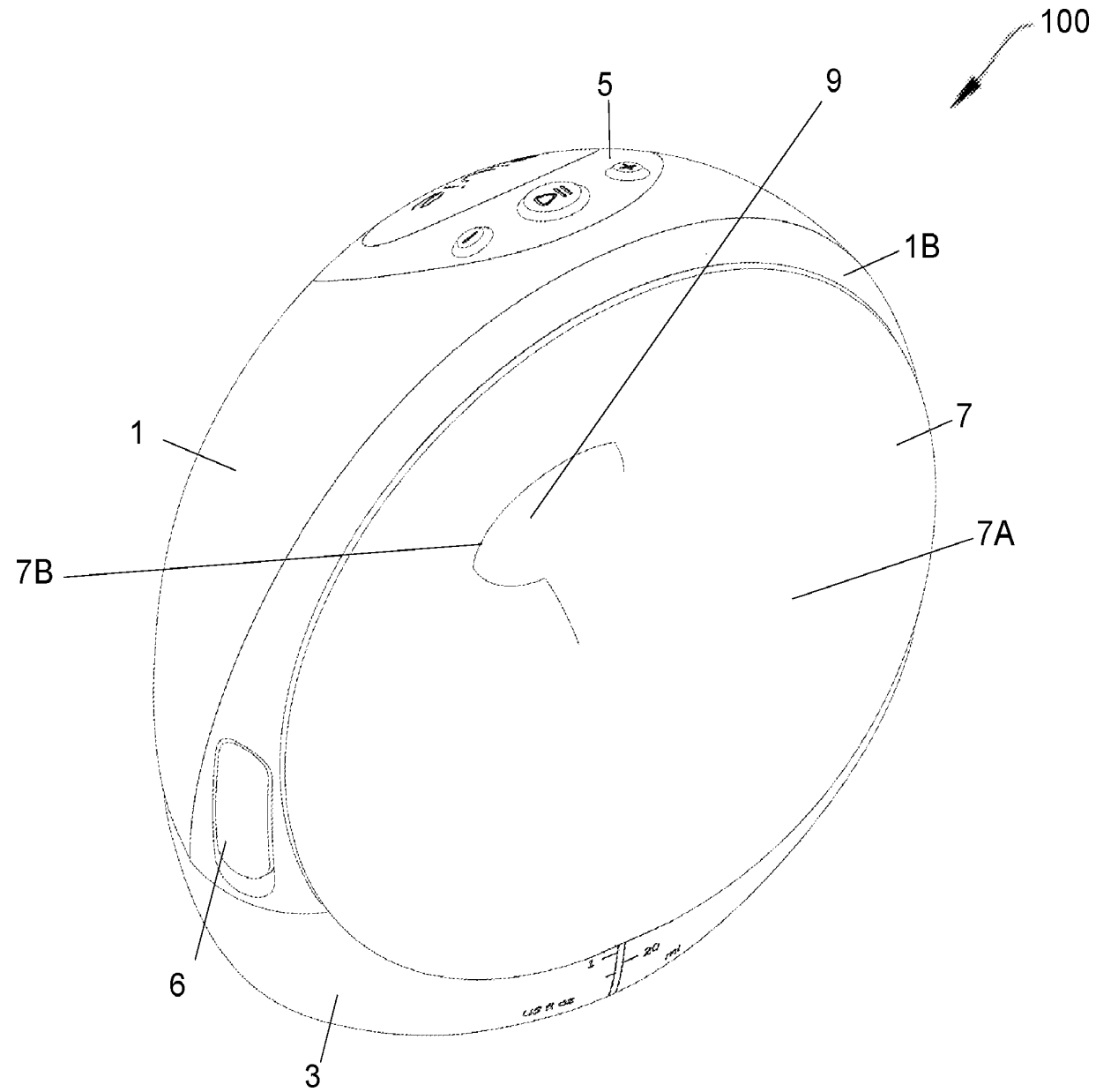


FIGURE 1



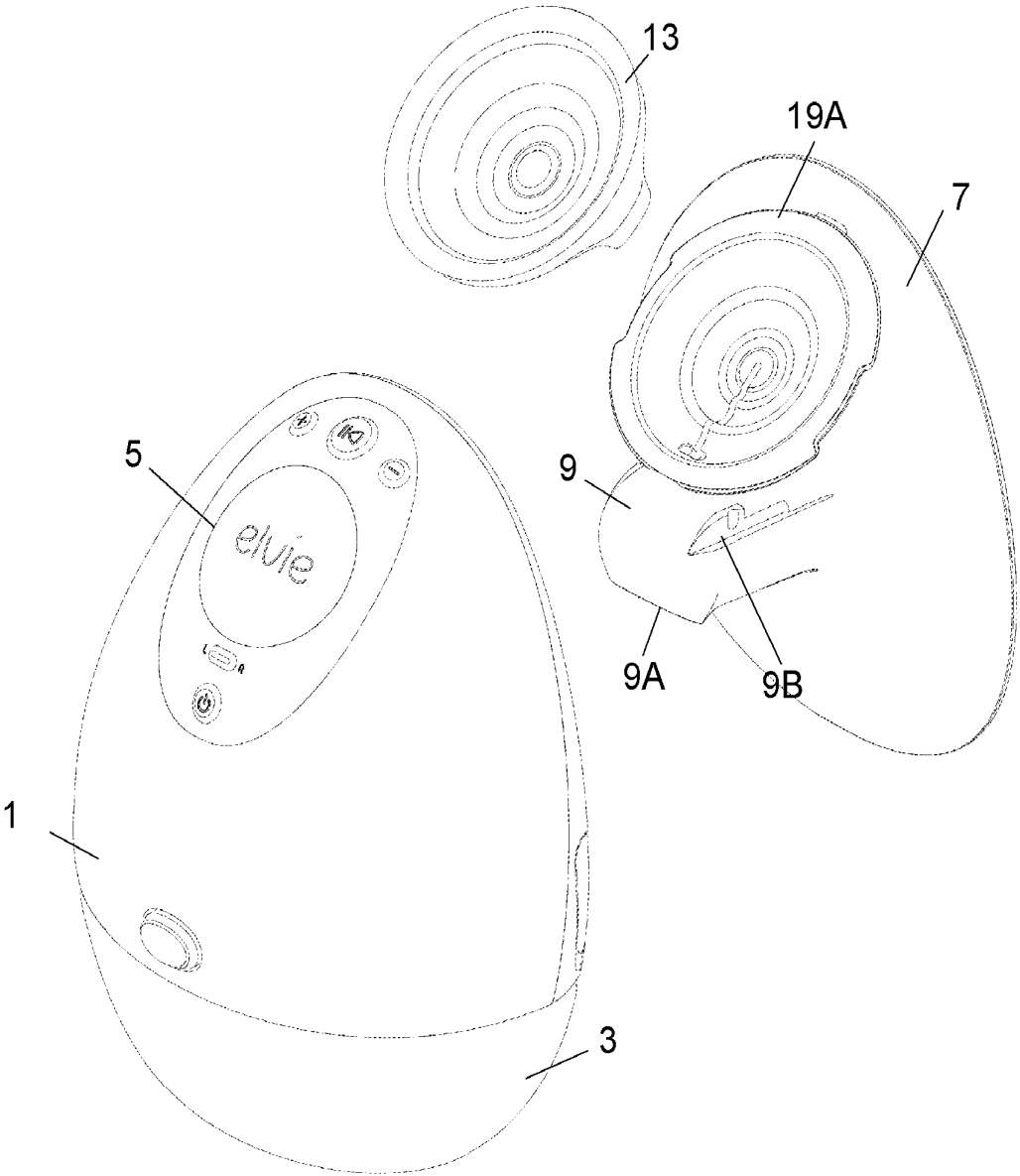


FIGURE 3

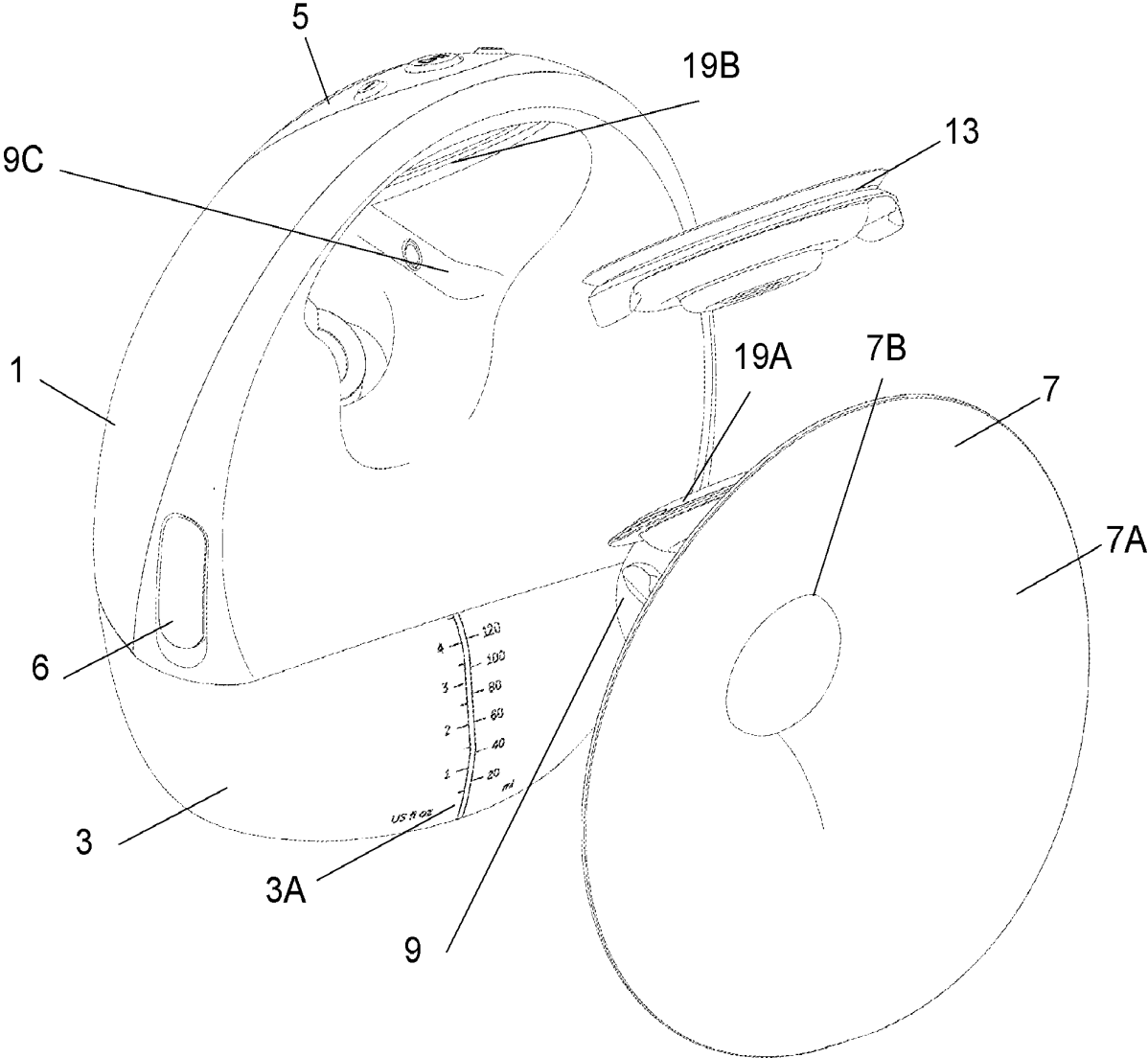


FIGURE 4

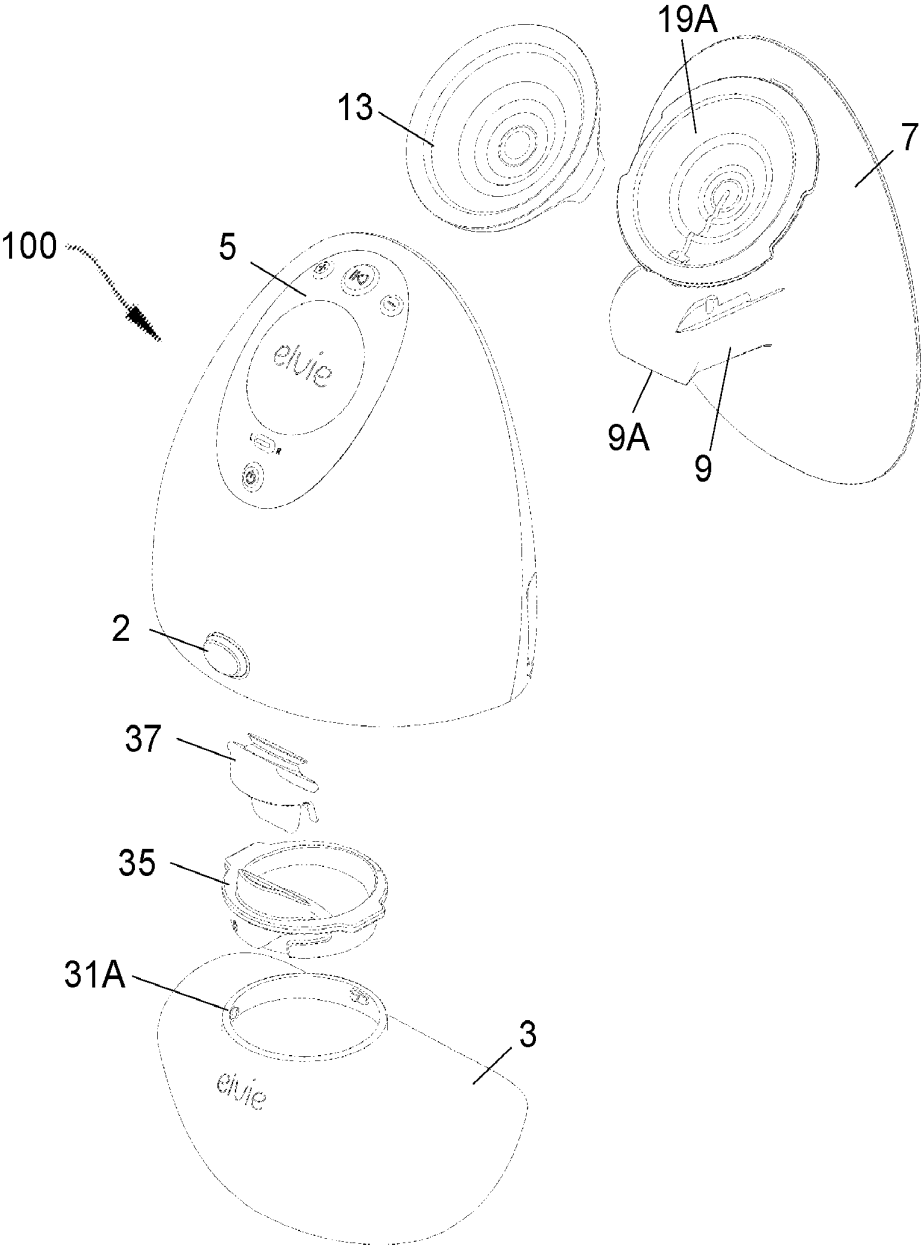


FIGURE 5

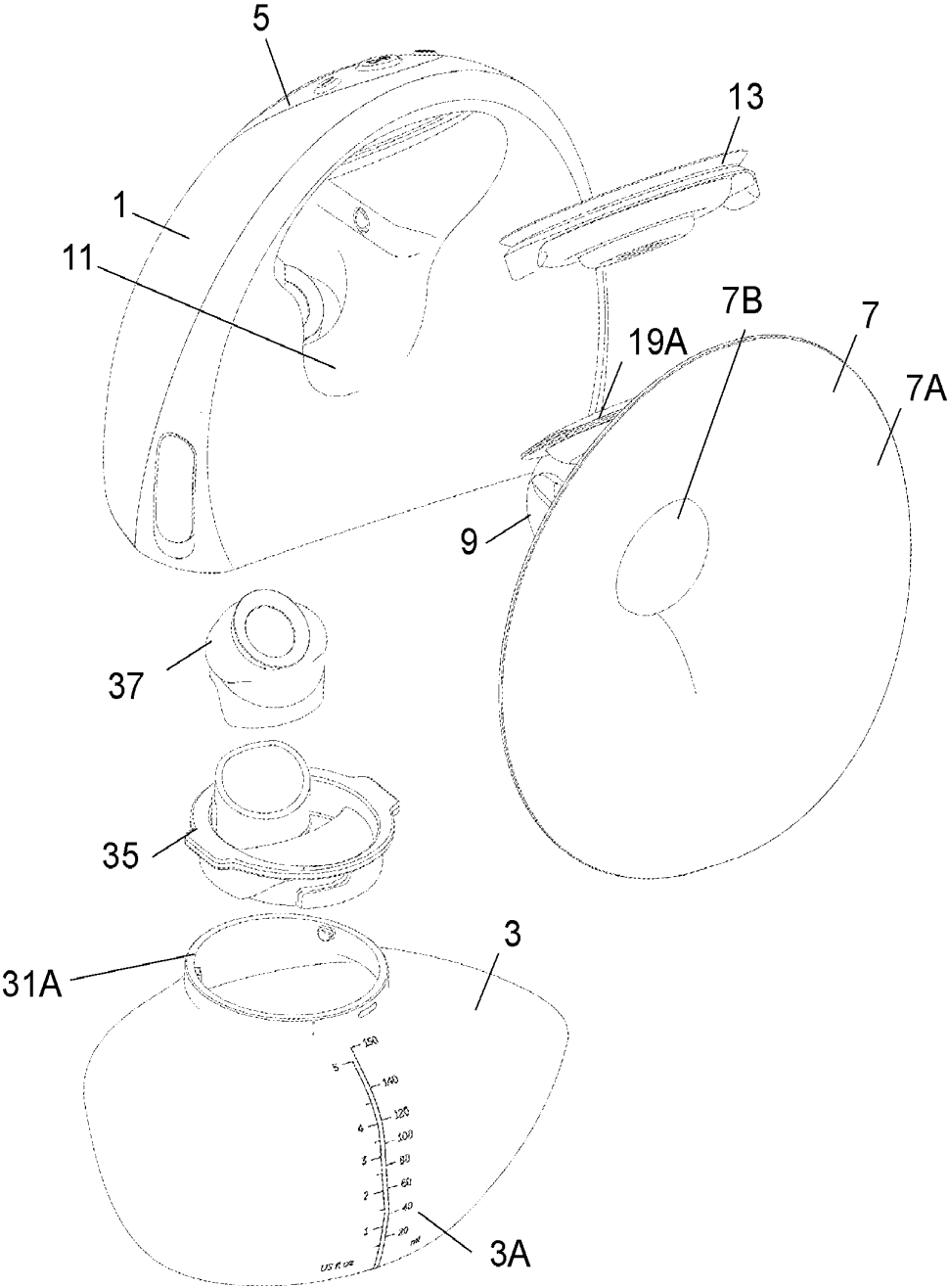


FIGURE 6

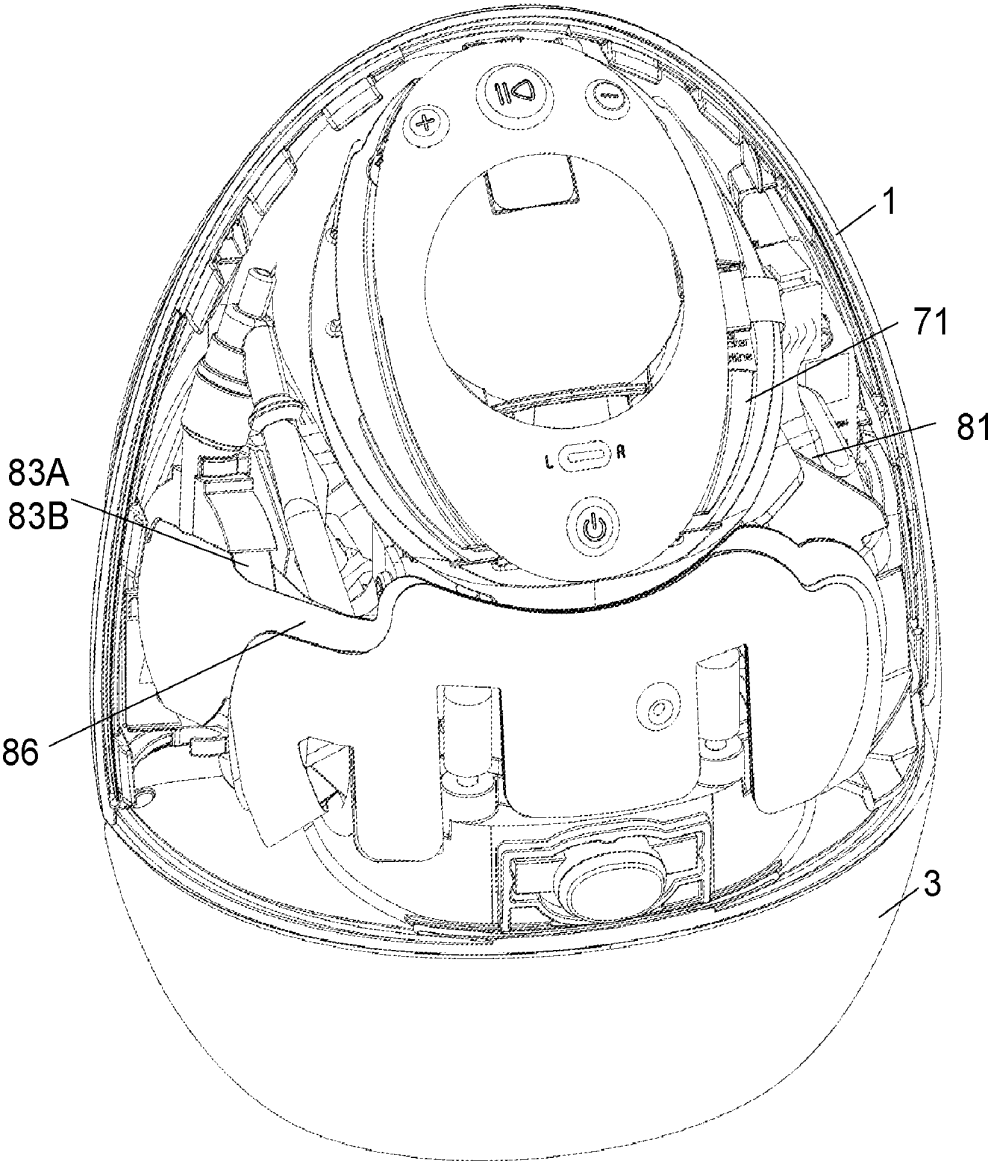


FIGURE 7

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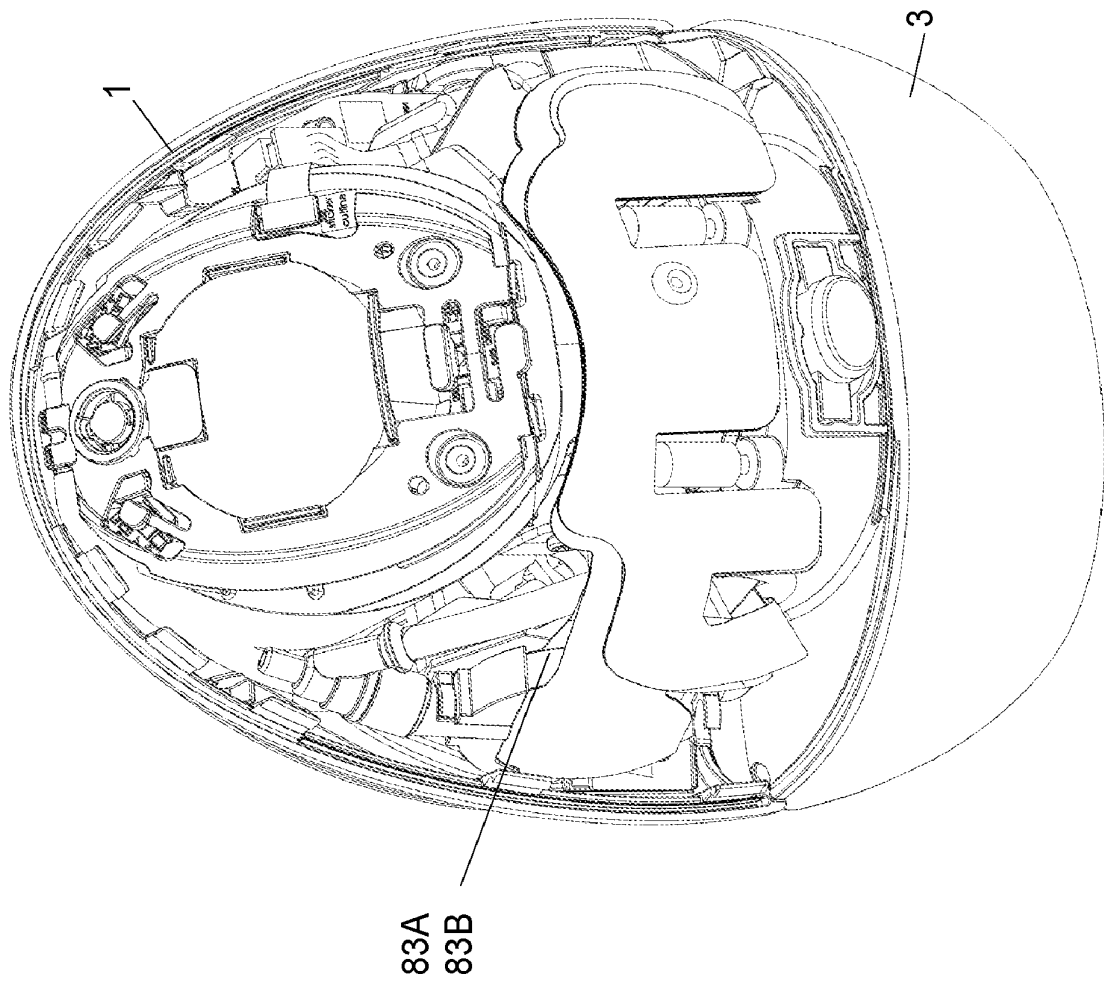


FIGURE 8



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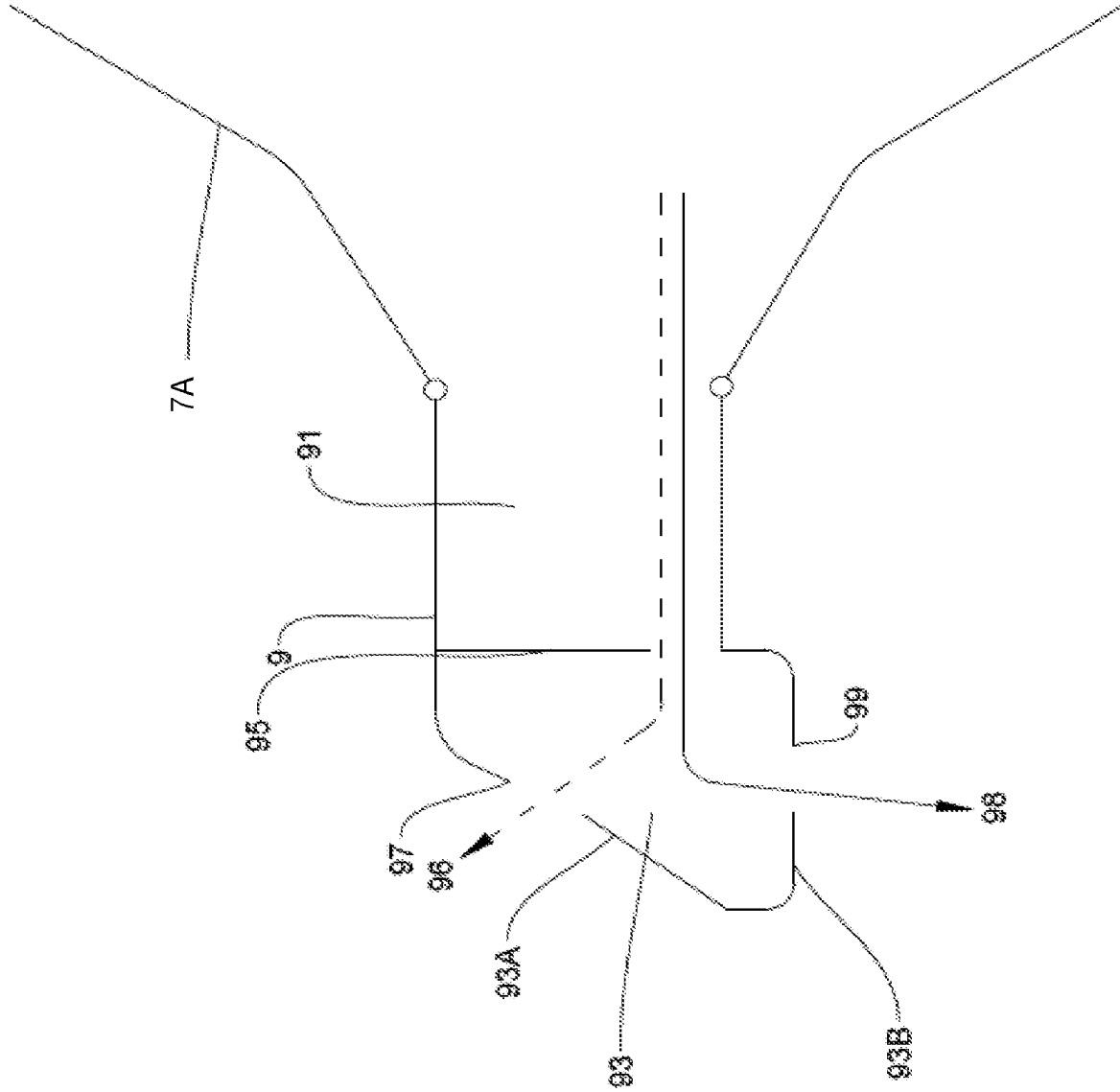


FIGURE 9

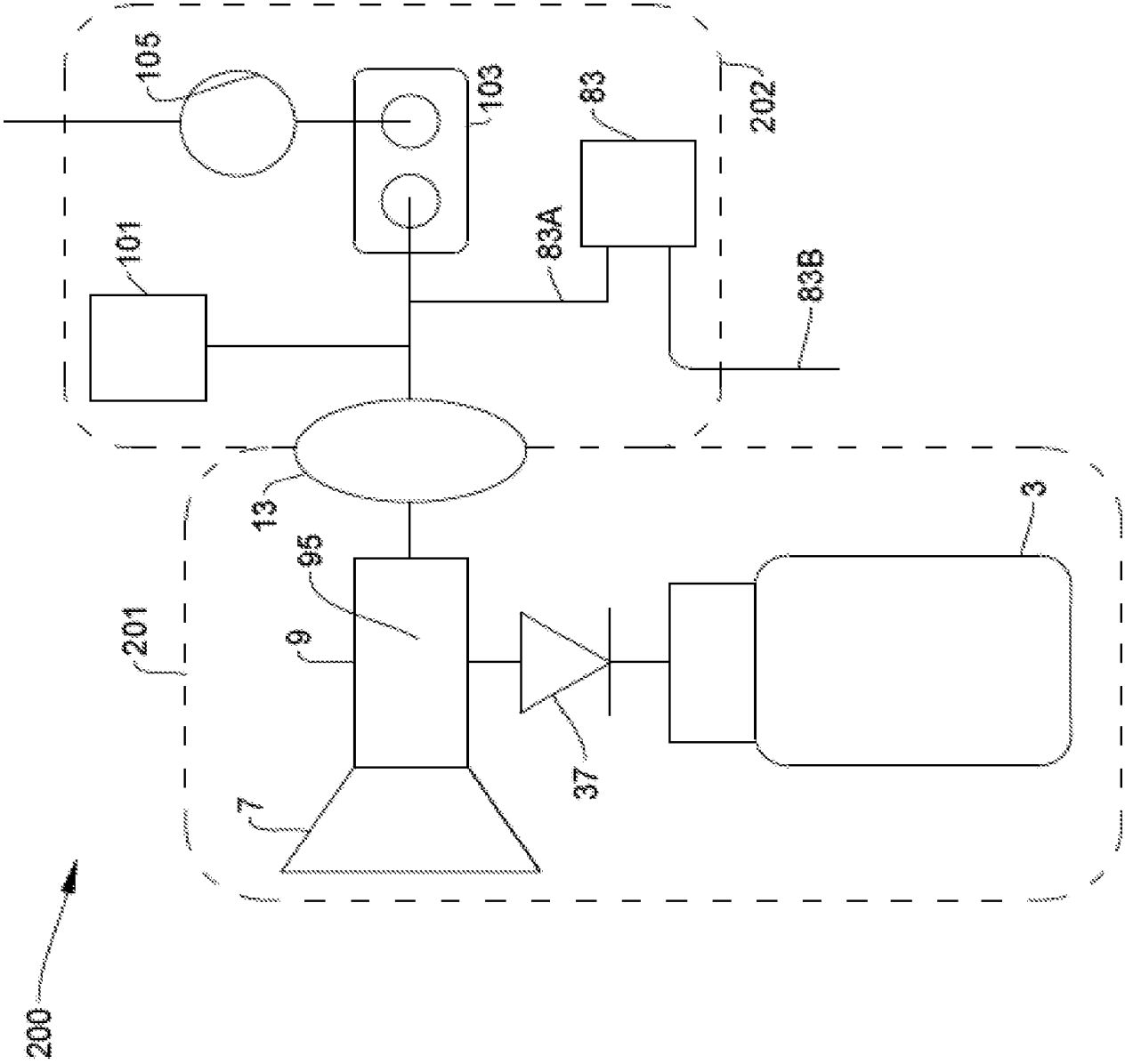


FIGURE 10

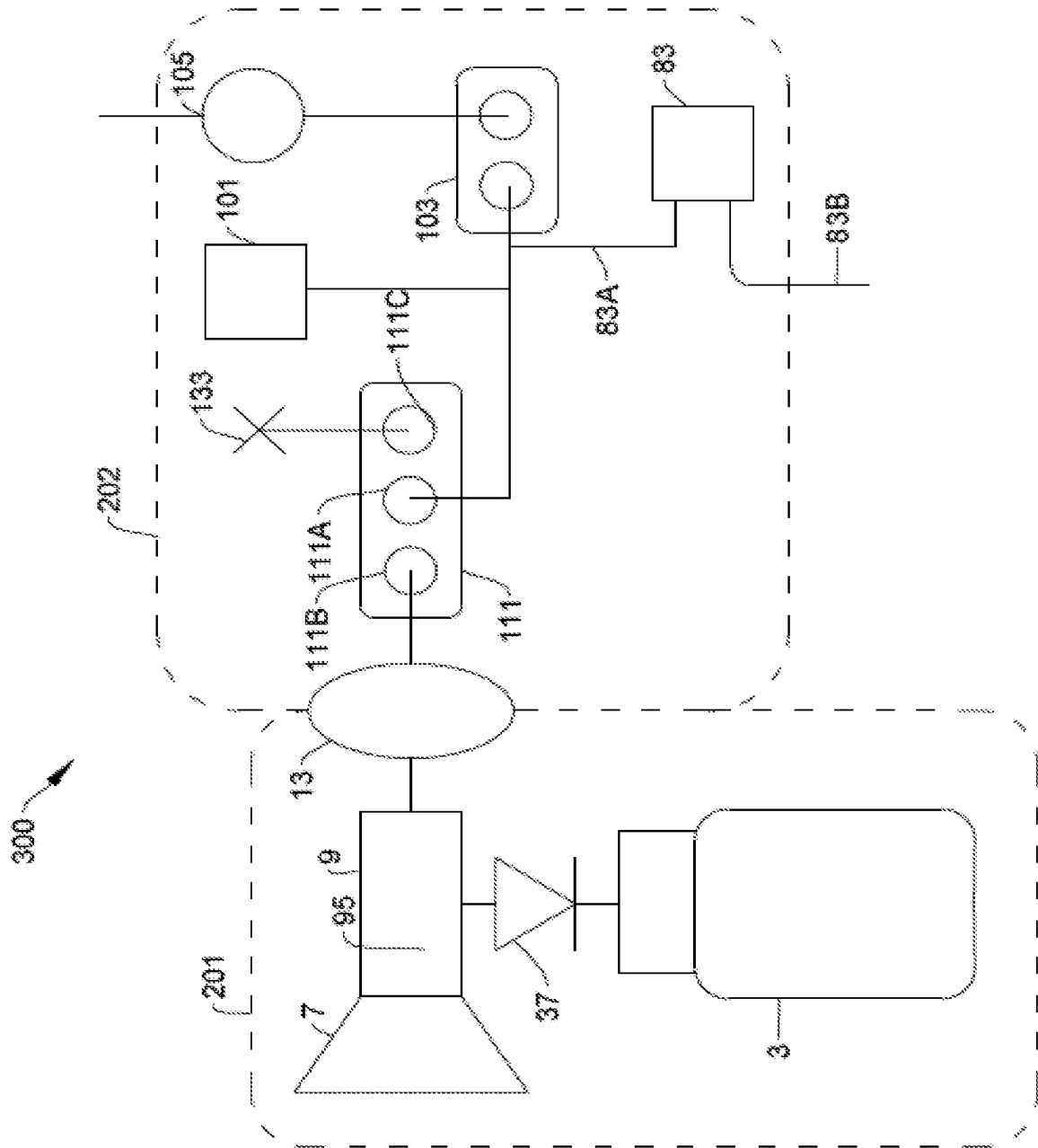


FIGURE 11

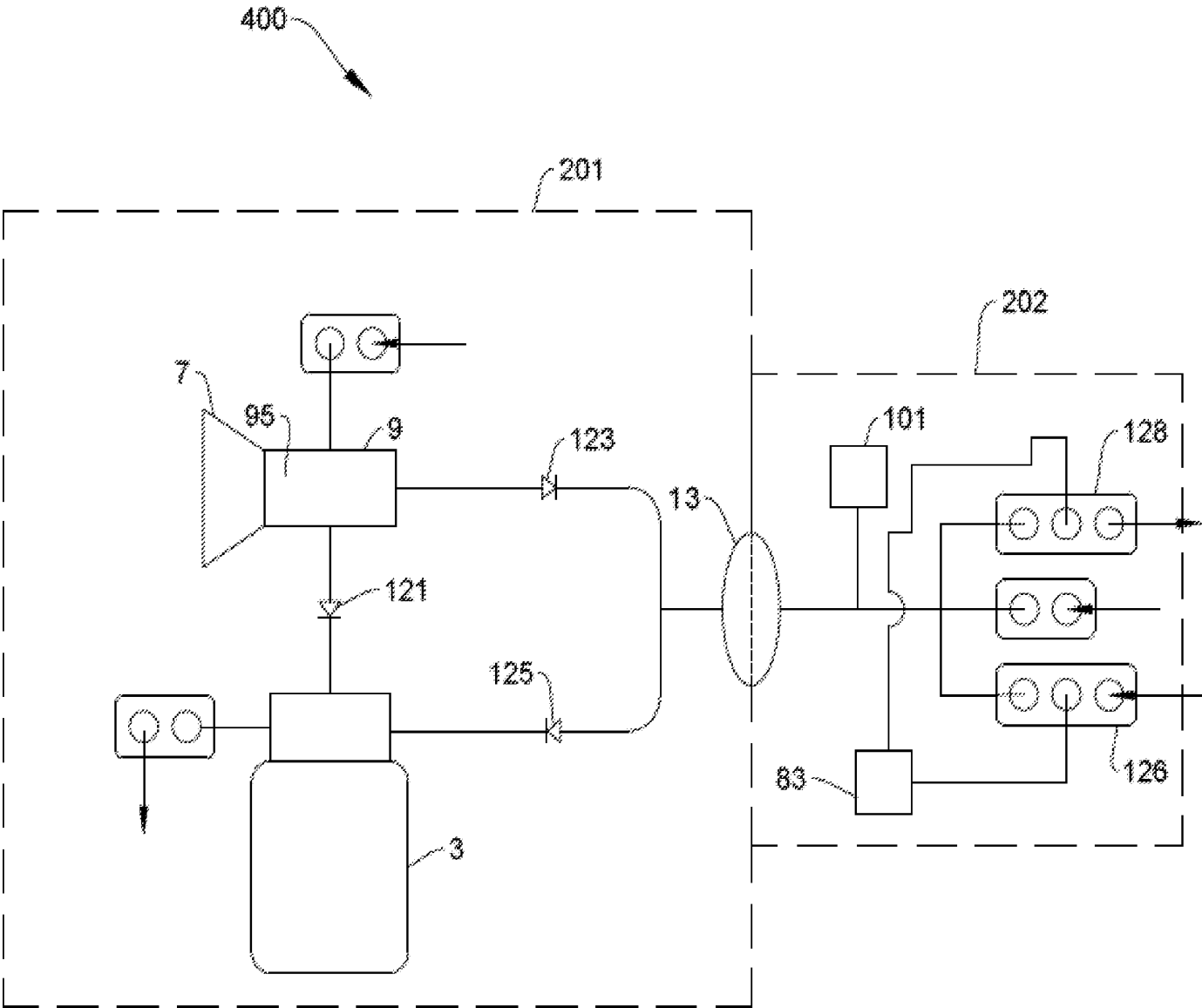


FIGURE 12



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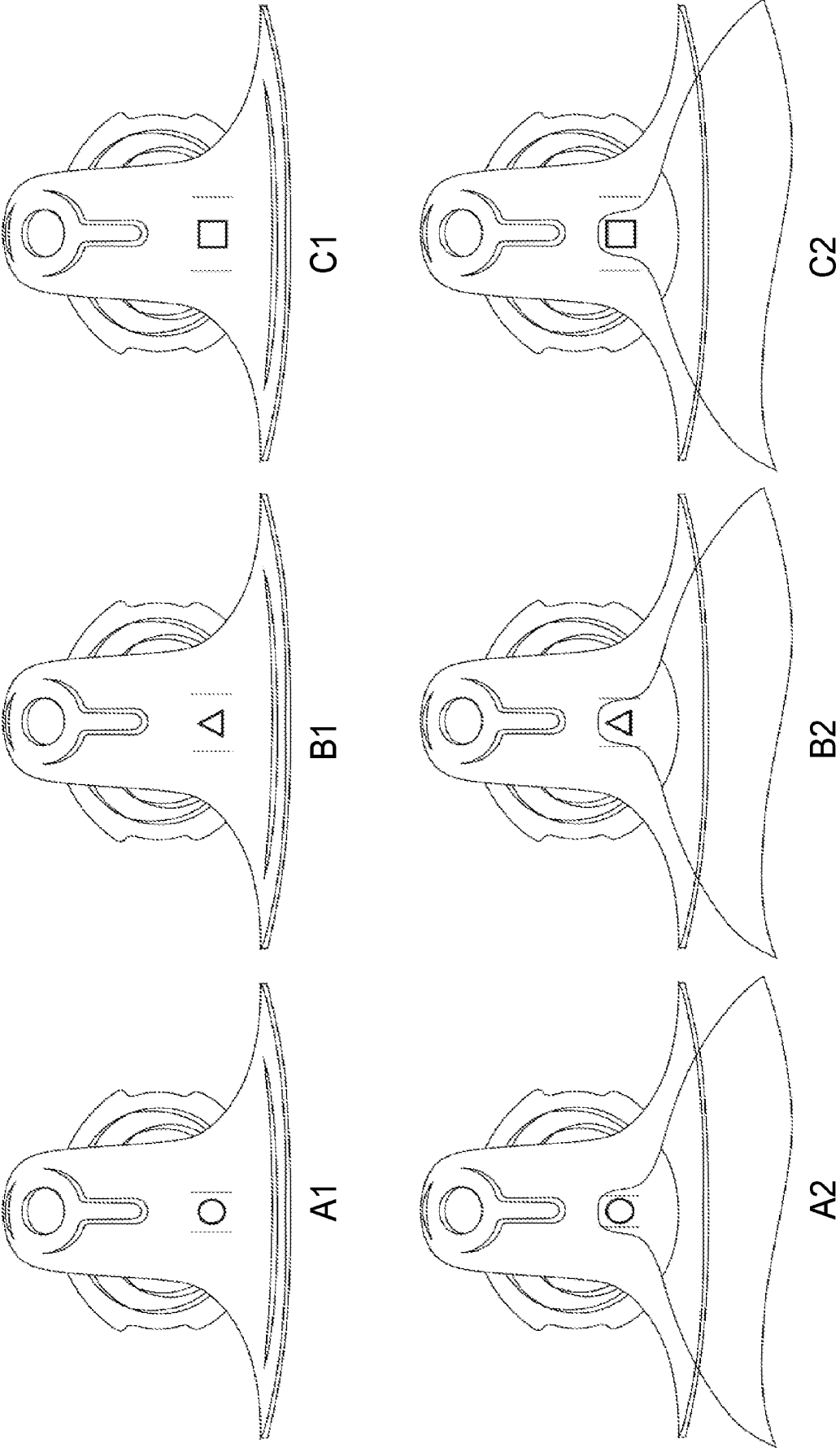


FIGURE 14

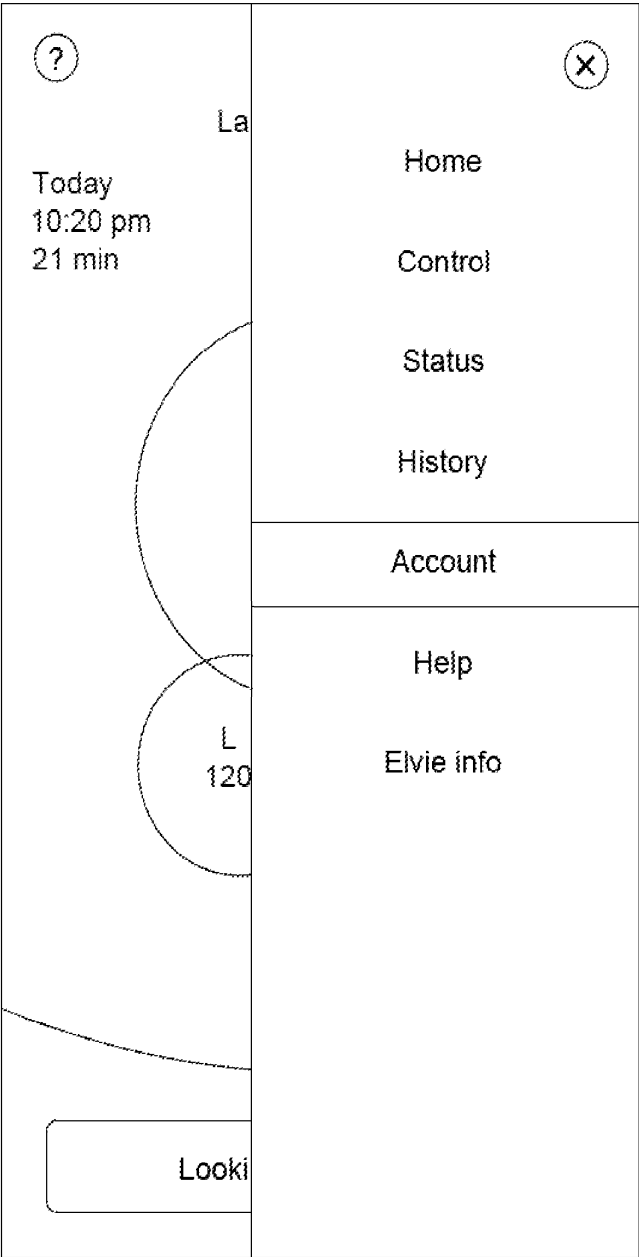


FIGURE 15

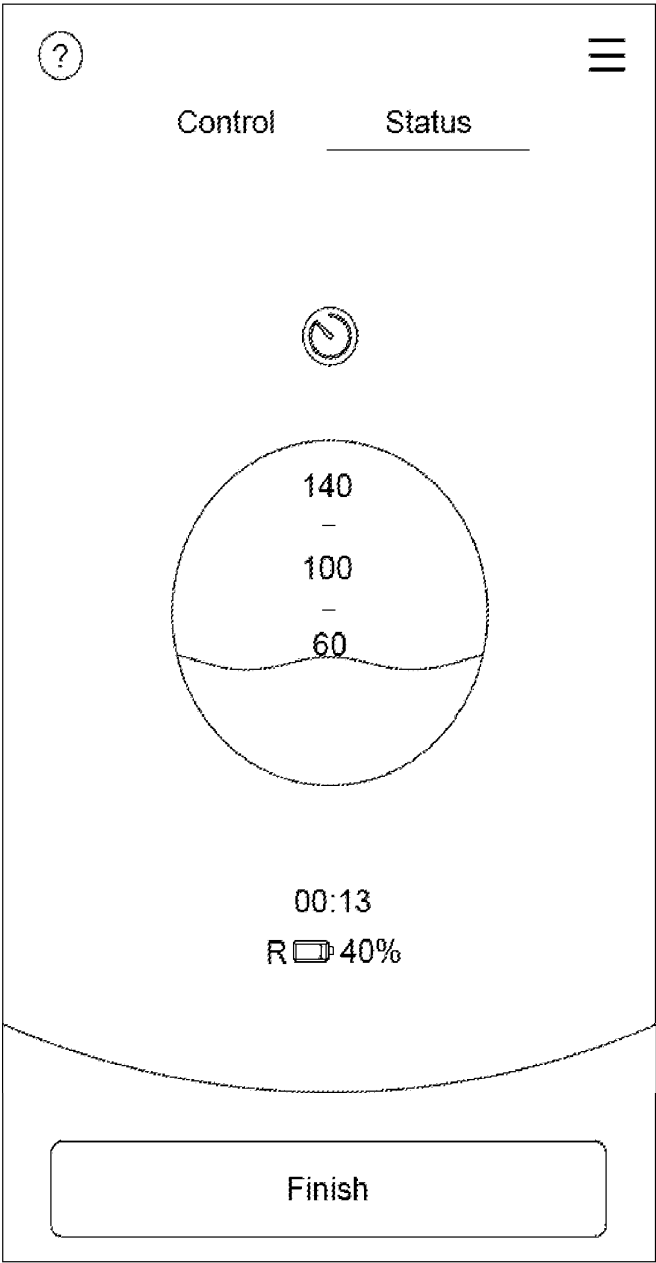


FIGURE 16



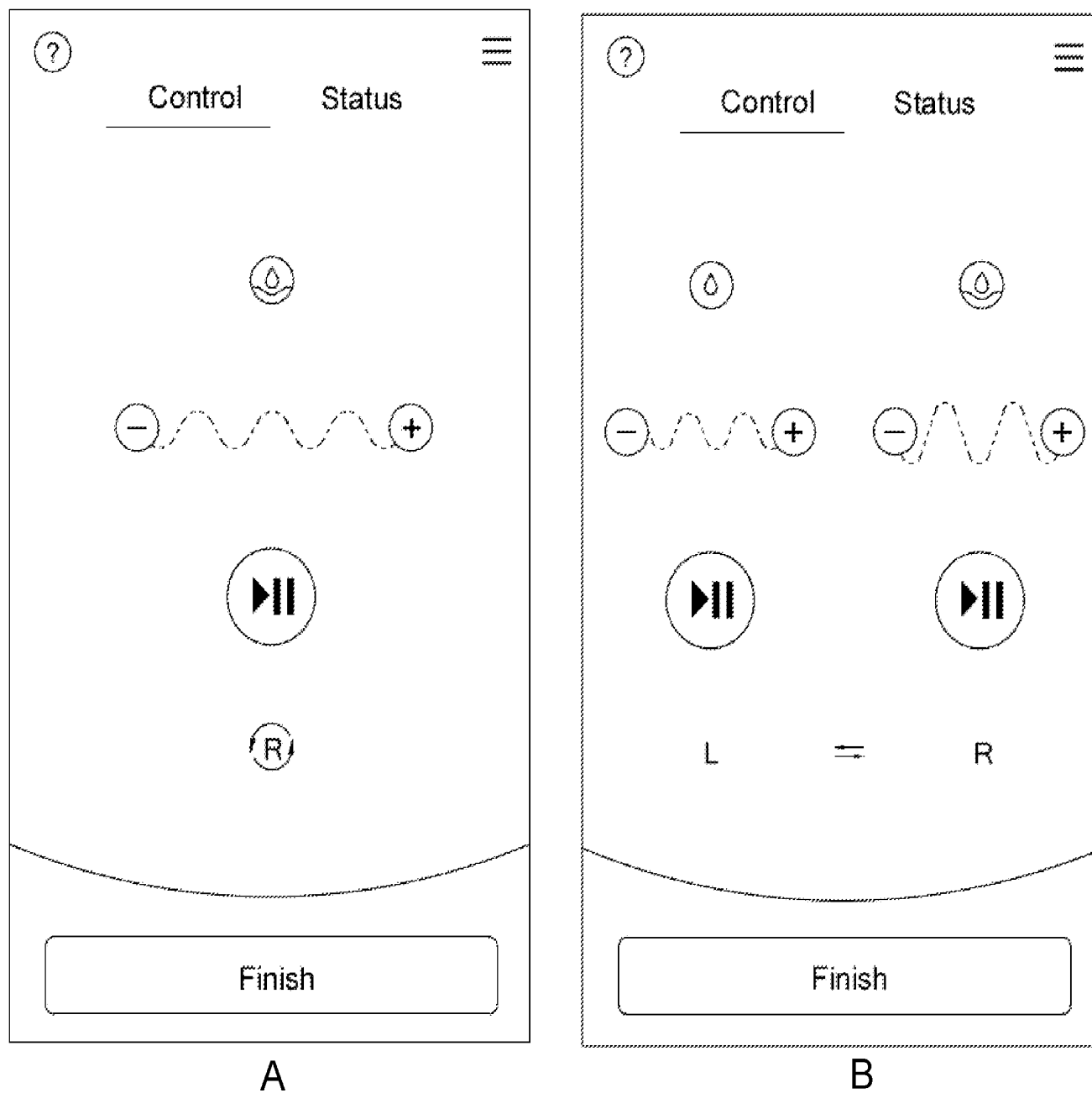


FIGURE 17

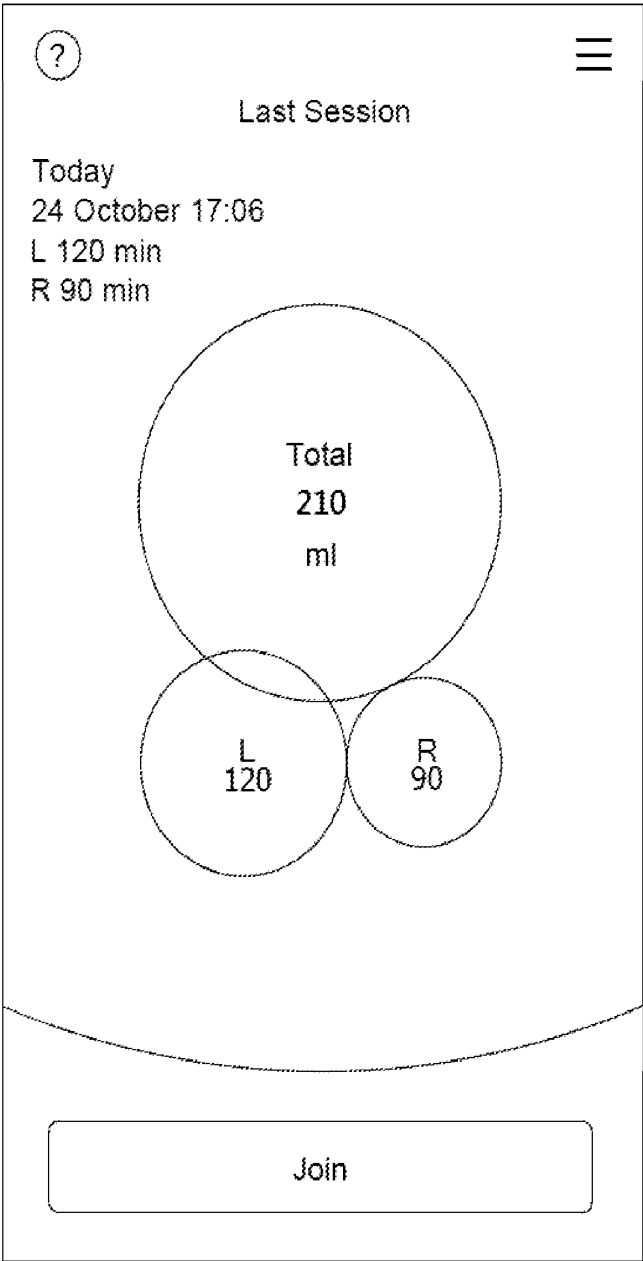


FIGURE 18

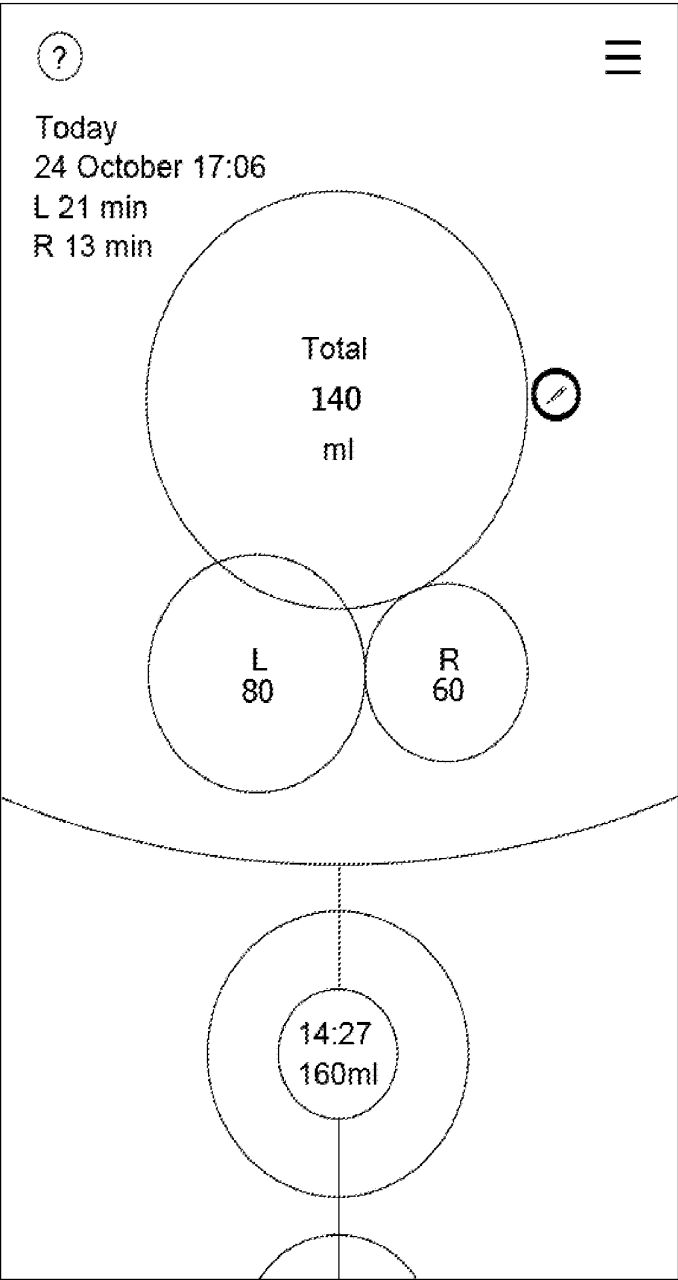


FIGURE 19

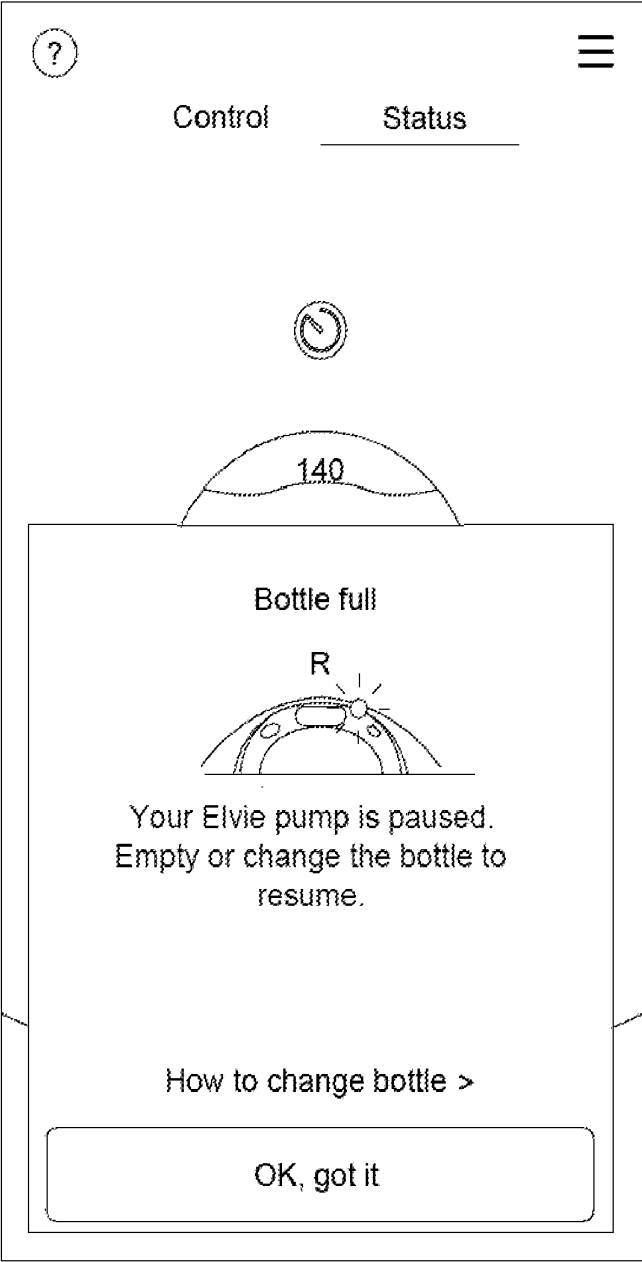


FIGURE 20

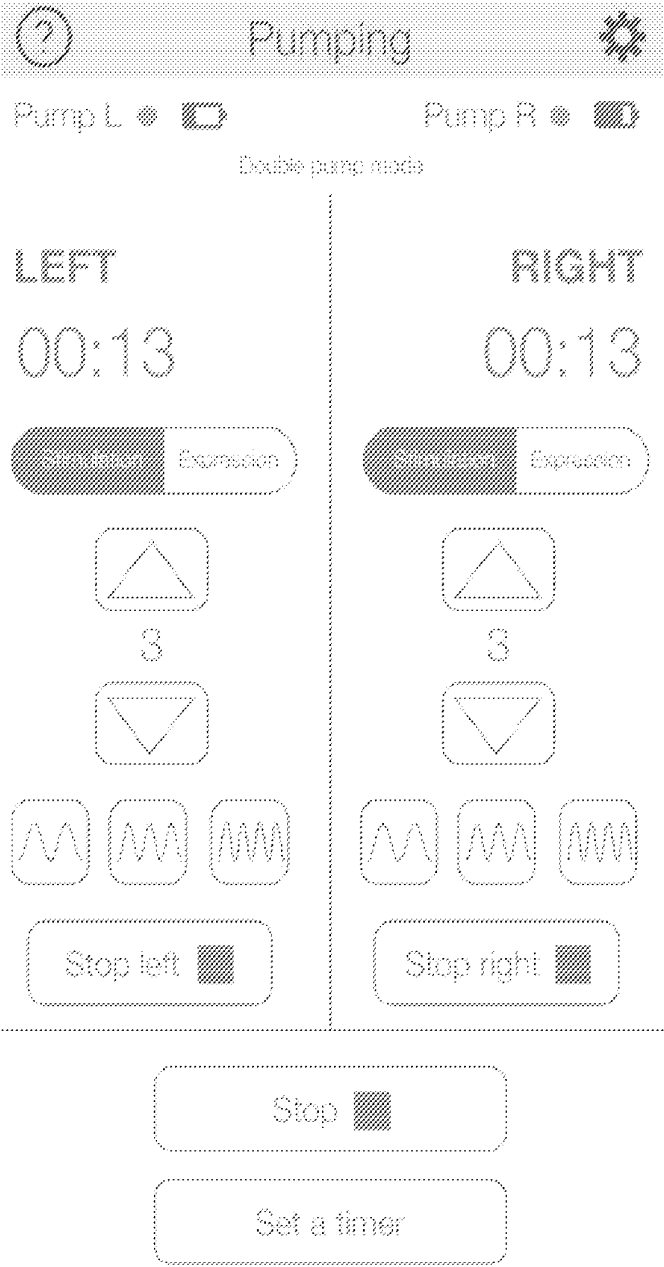
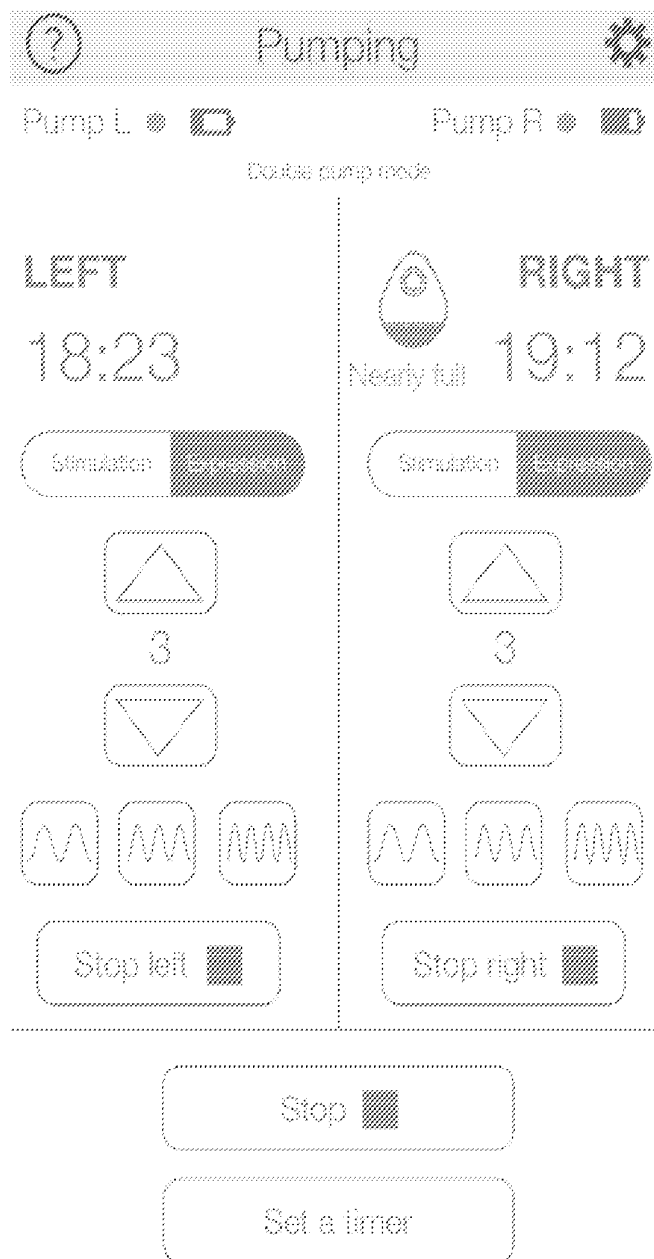


FIGURE 21



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FIGURE 22




FIGURE 23

?

Stopped

Pump L 

Pump R 

Double pump mode

LEFT


21:02

STOPPED

Total volume in bottle:

60 ml

☐ Tick if you emptied or changed the bottle

Resume left 

RIGHT


20:38


STOPPED

Total volume in bottle:

65 ml

☐ Tick if you emptied or changed the bottle

Resume right 

Resume 

End session

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FIGURE 24



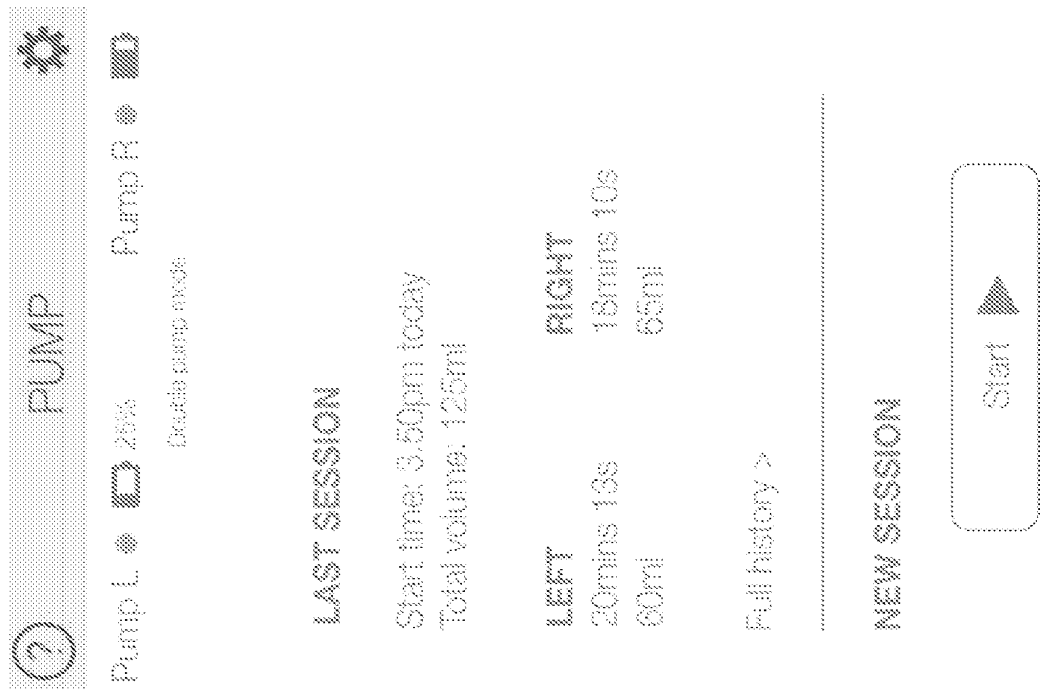


FIGURE 25

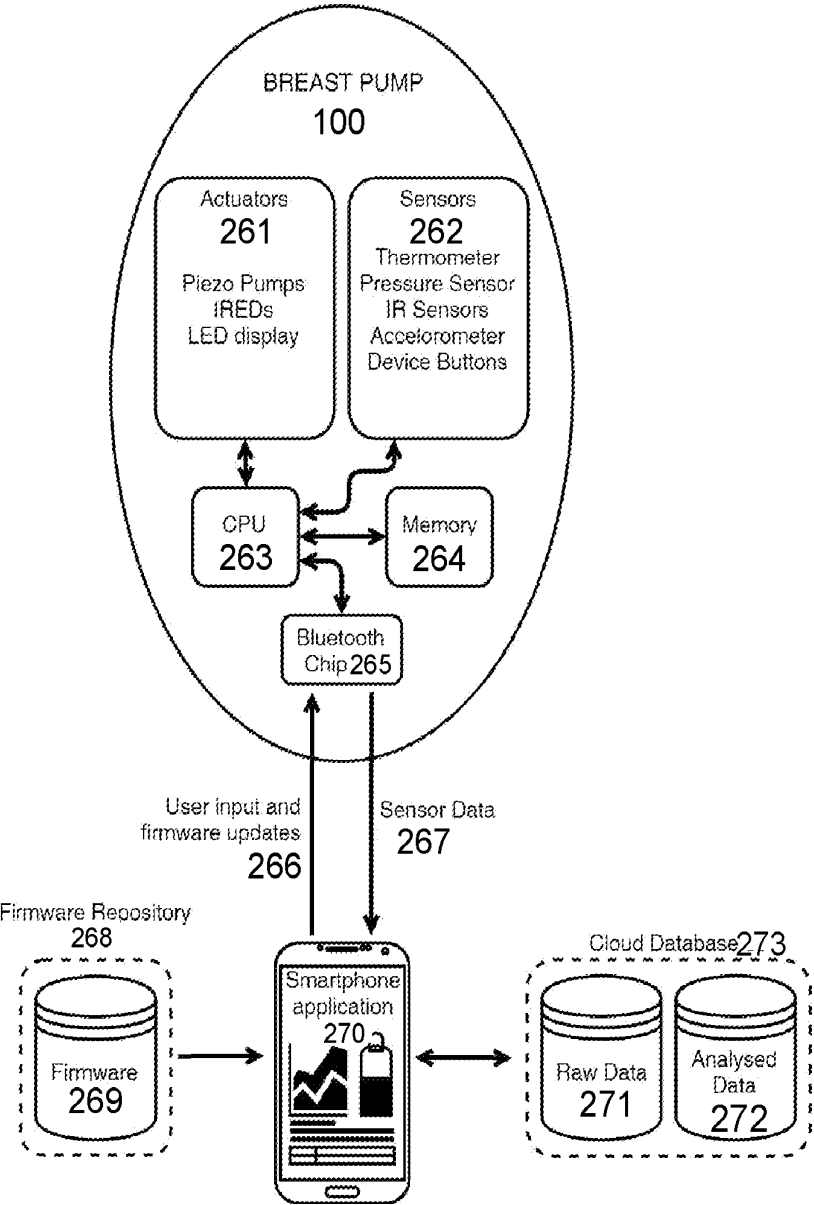
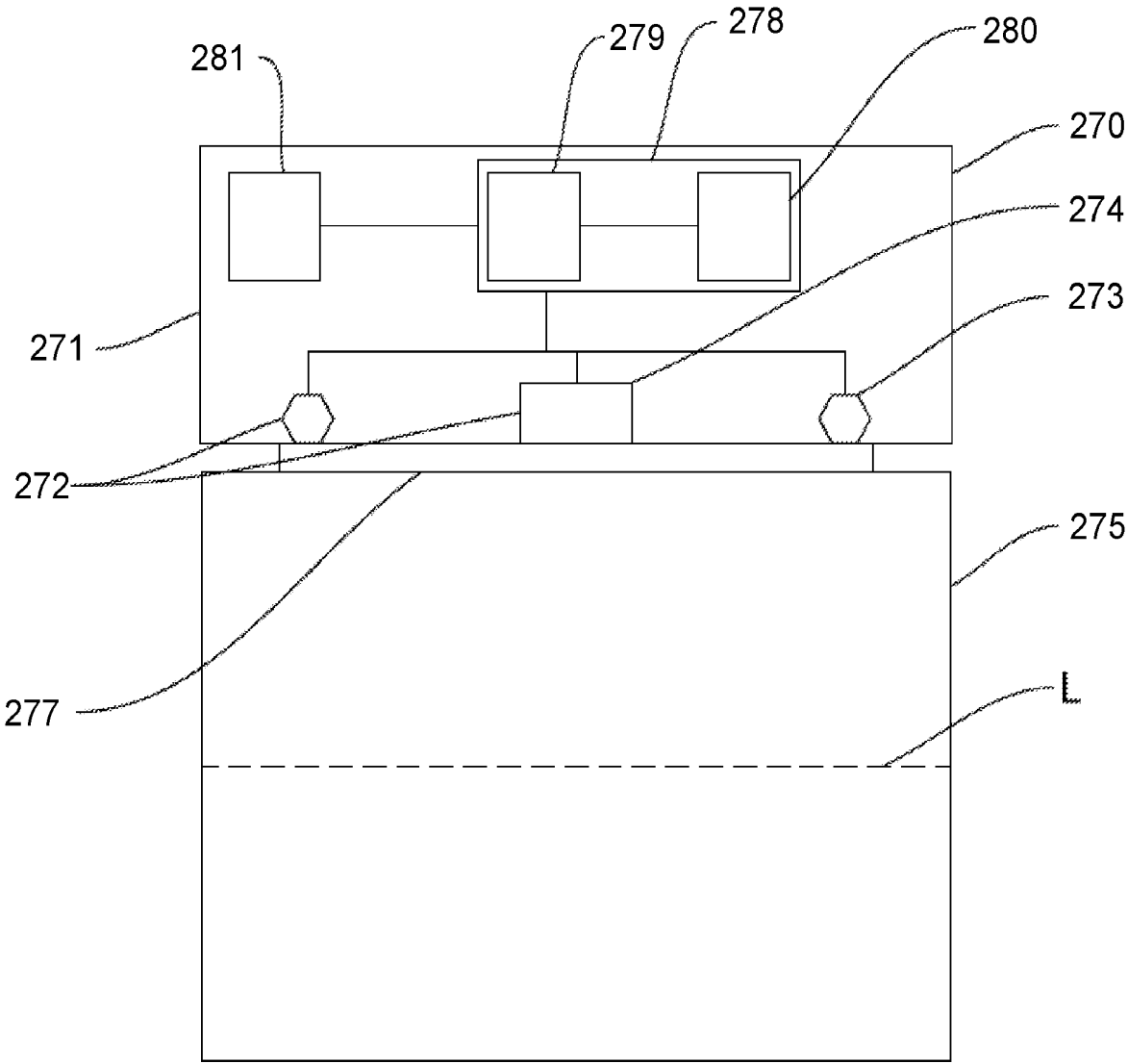
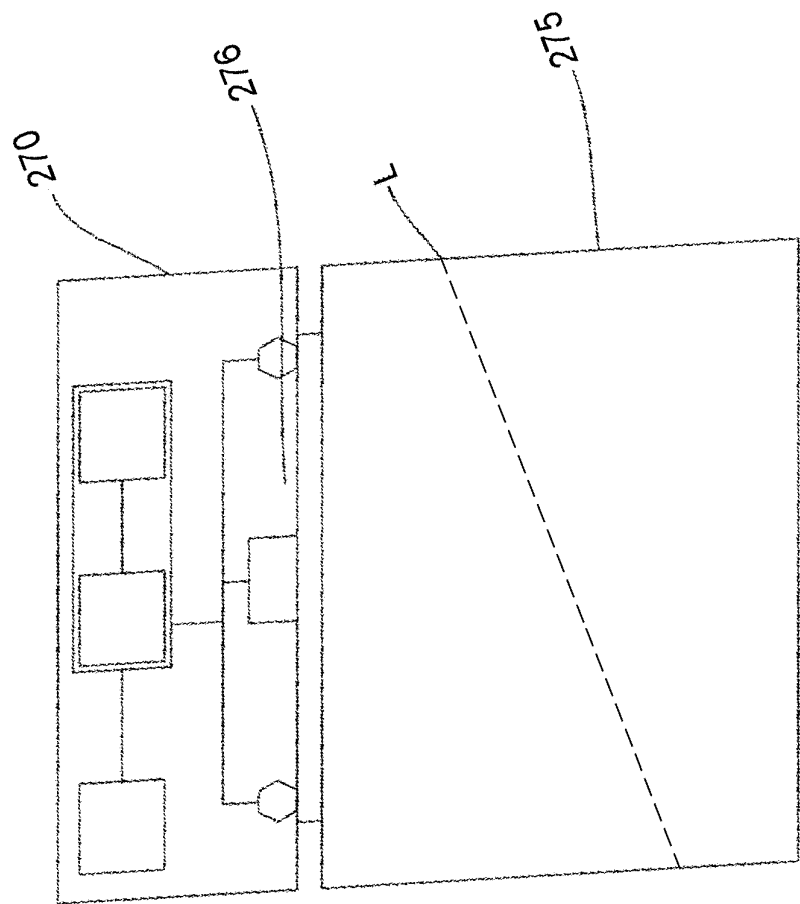


FIGURE 26



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FIGURE 27



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FIGURE 28

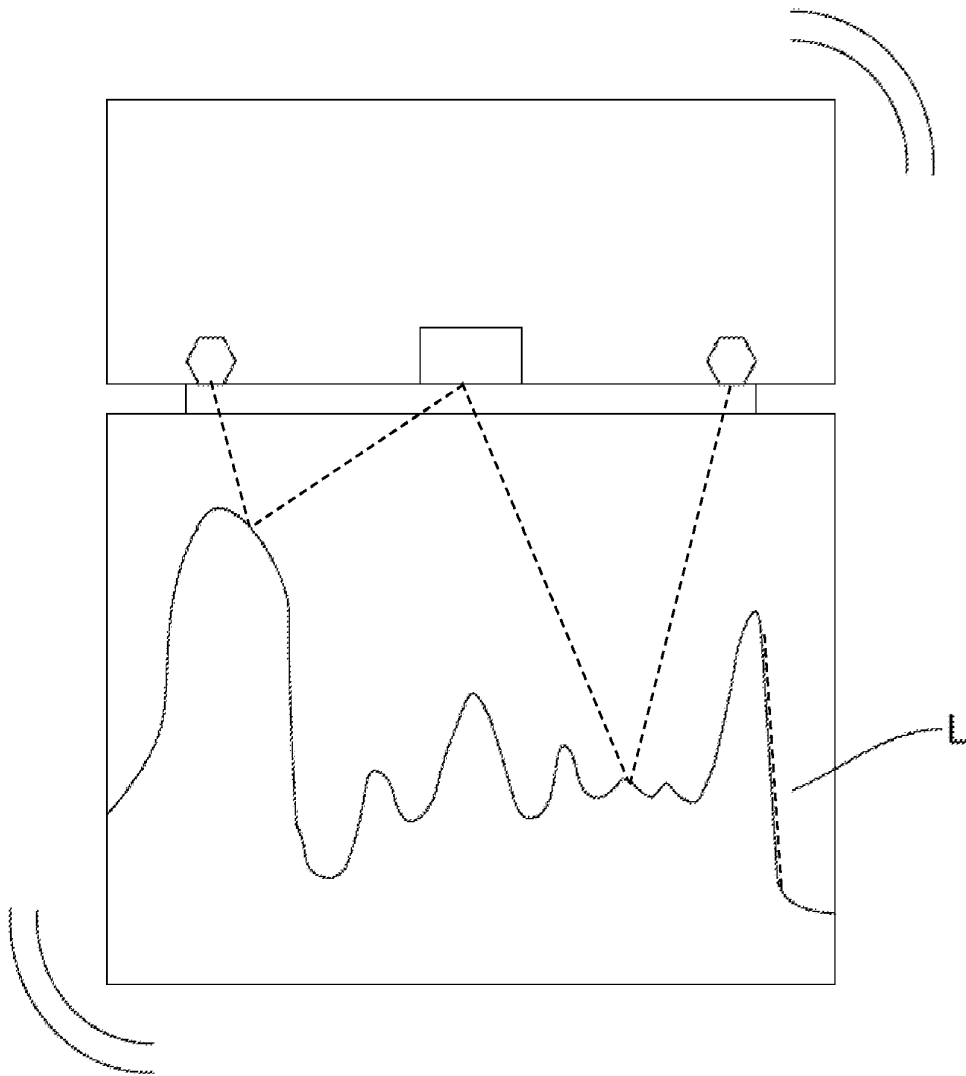


FIGURE 29

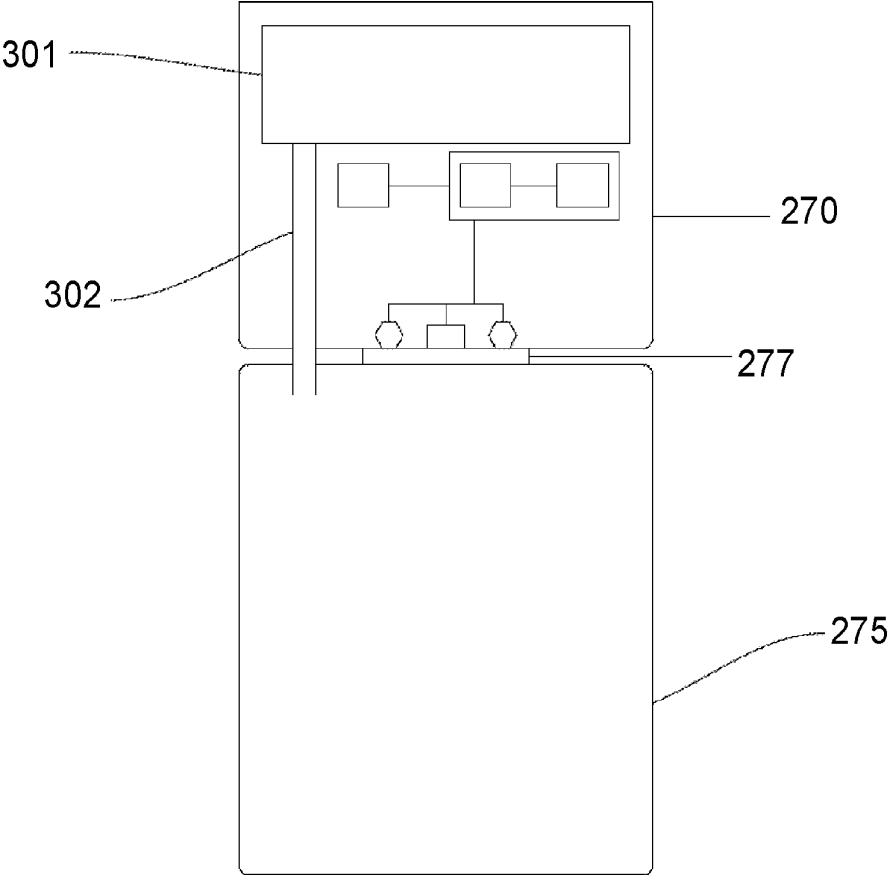


FIGURE 30

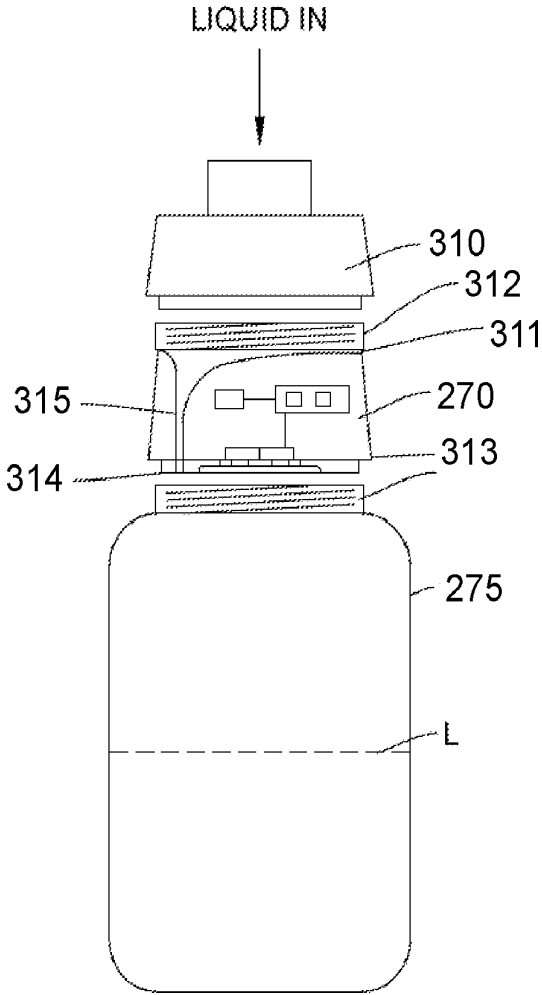
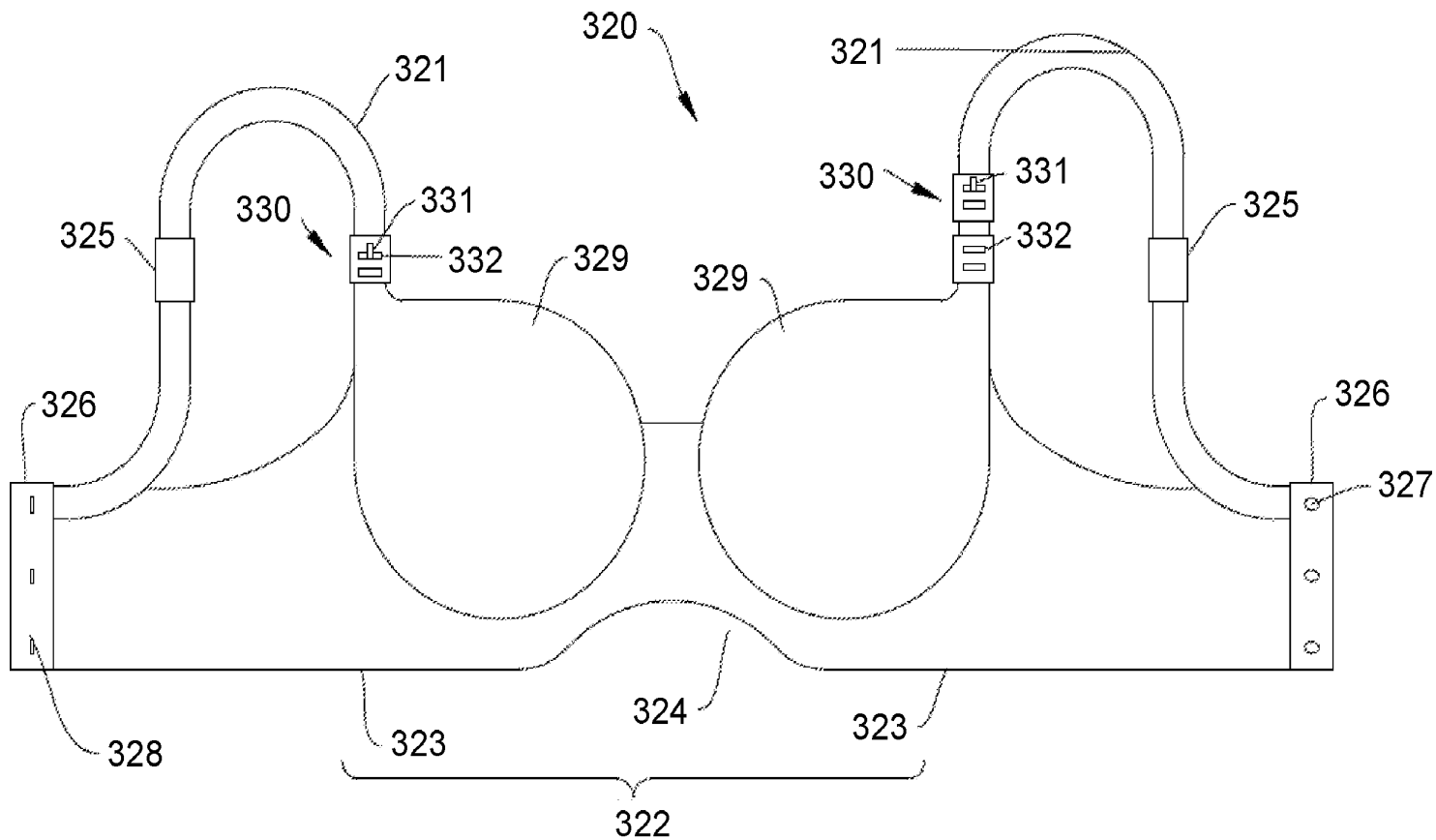


FIGURE 31



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FIGURE 32



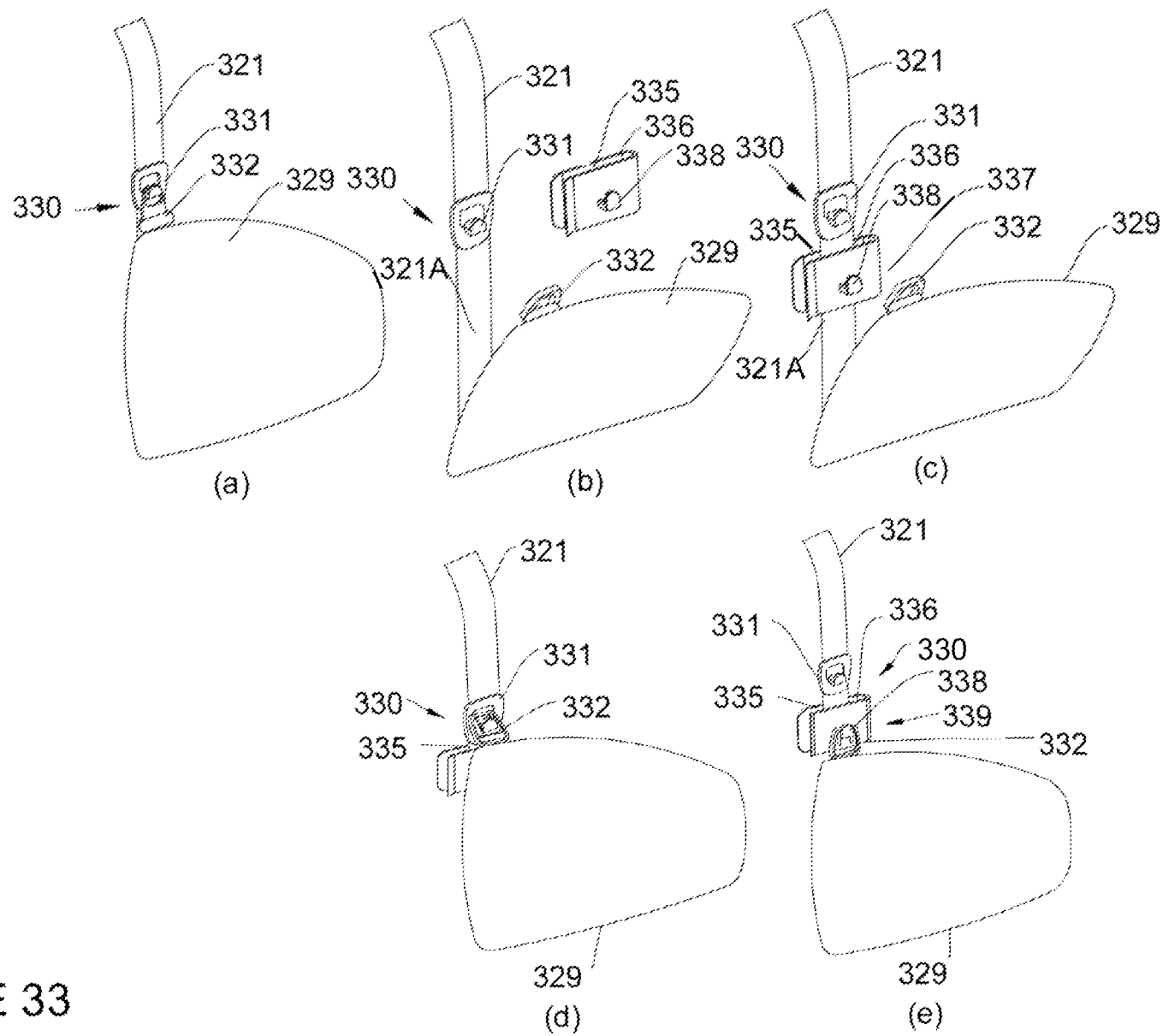
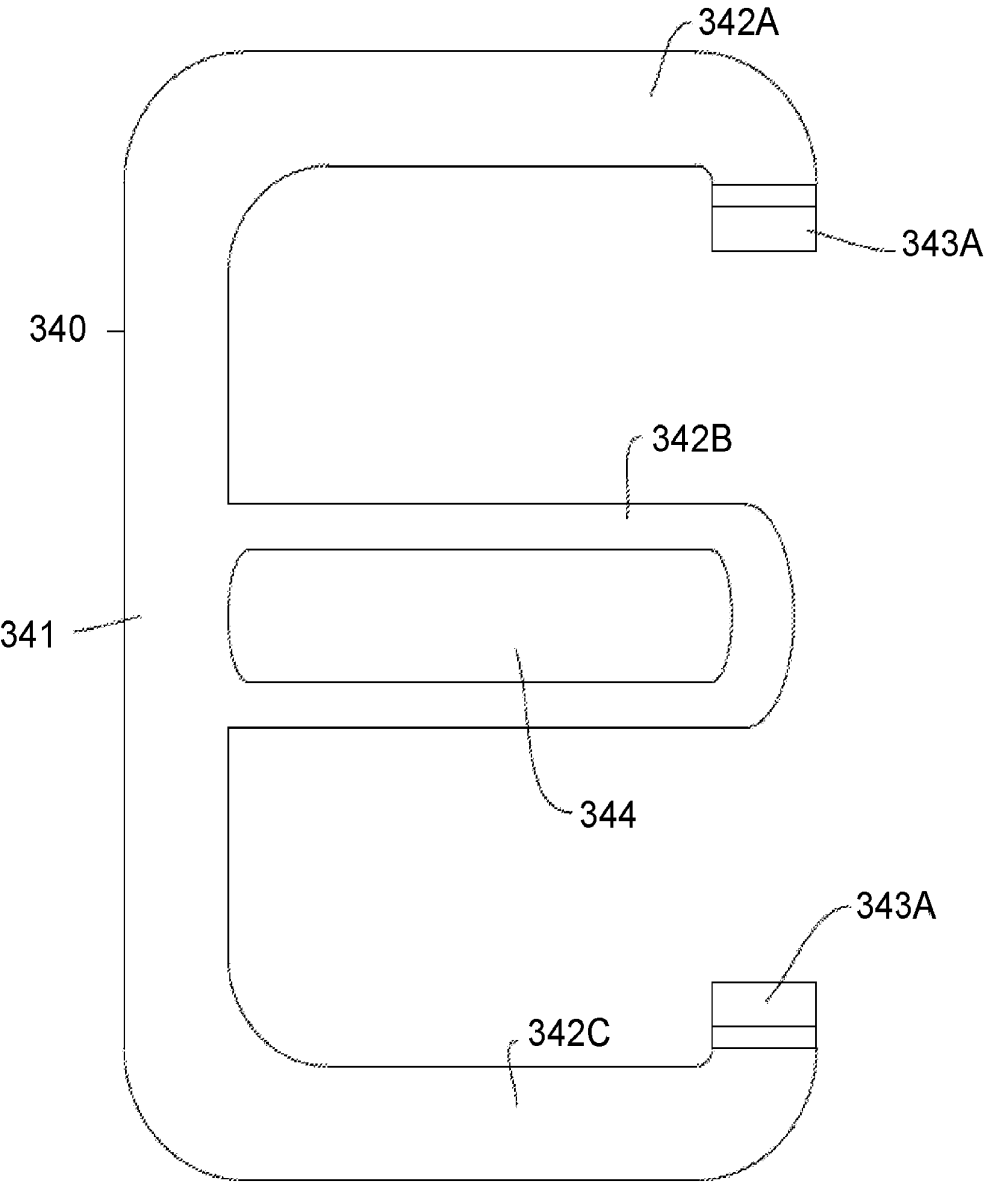


FIGURE 33



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FIGURE 34

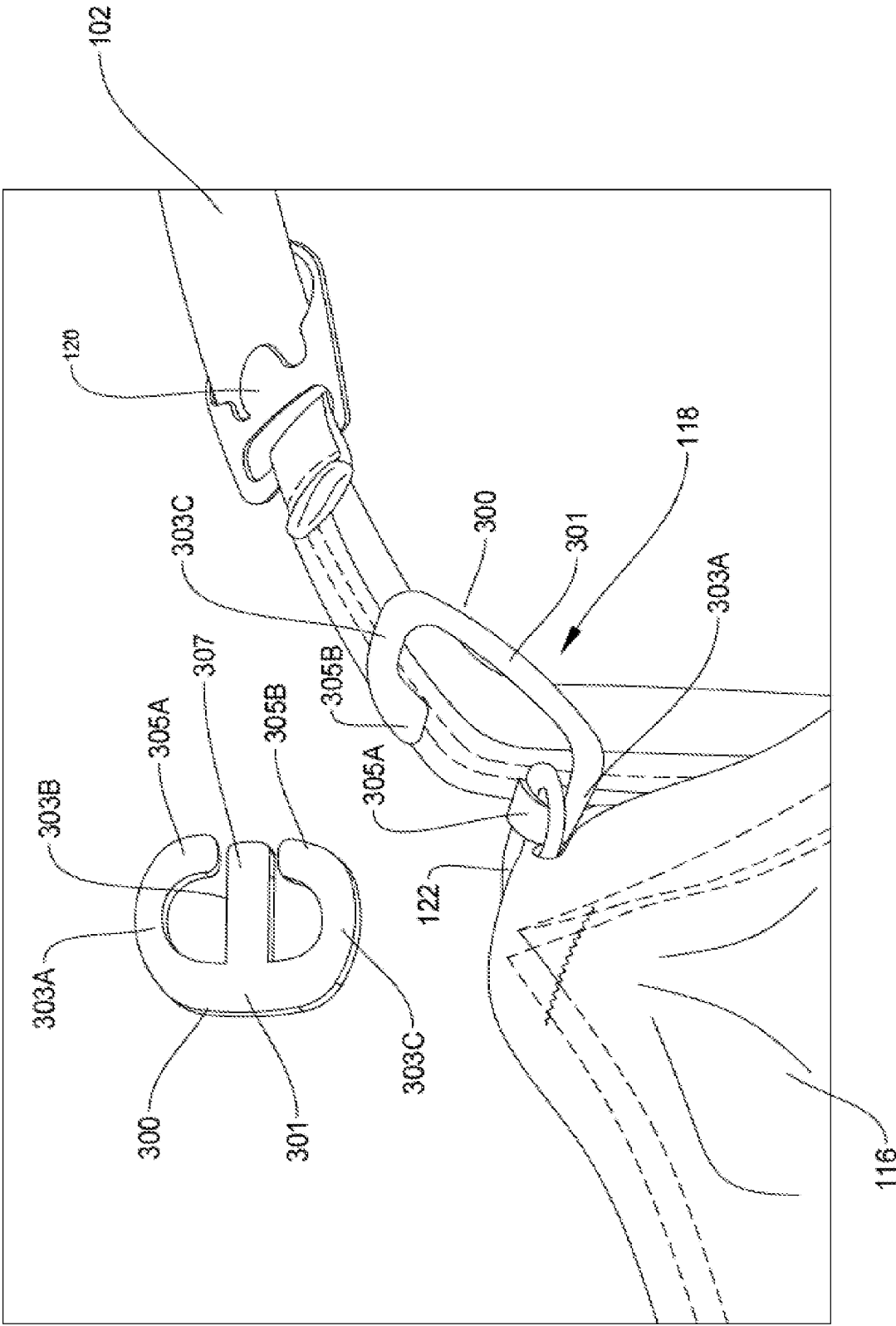


FIGURE 35

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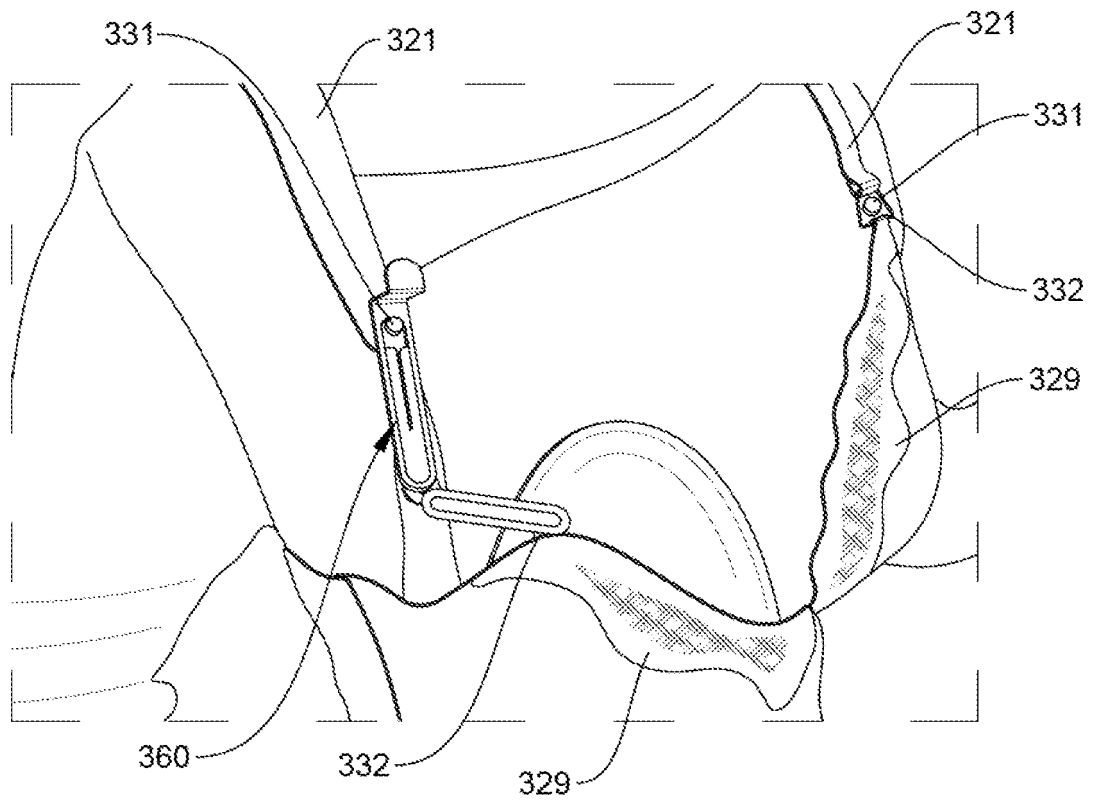
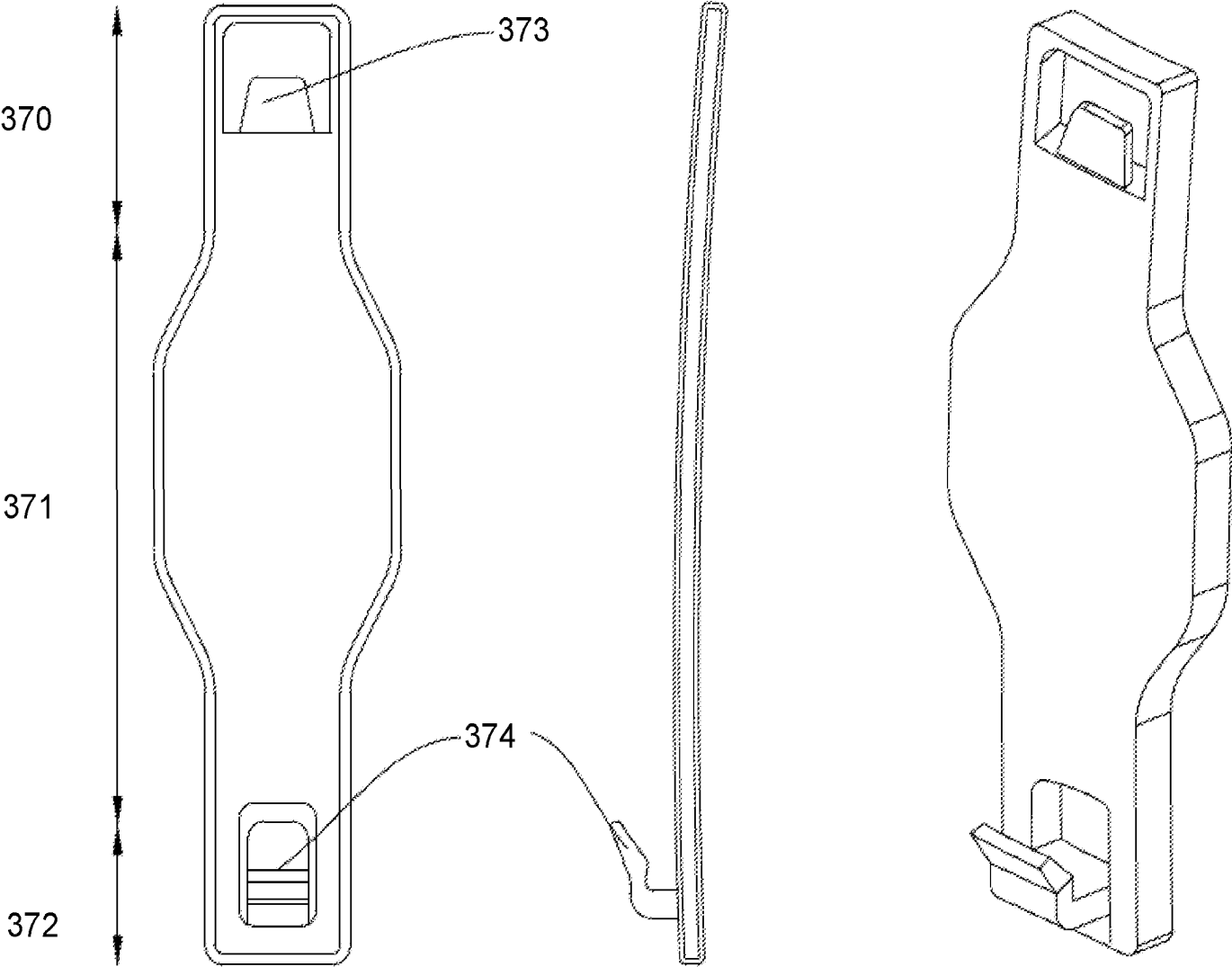


FIGURE 36



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FIGURE 37

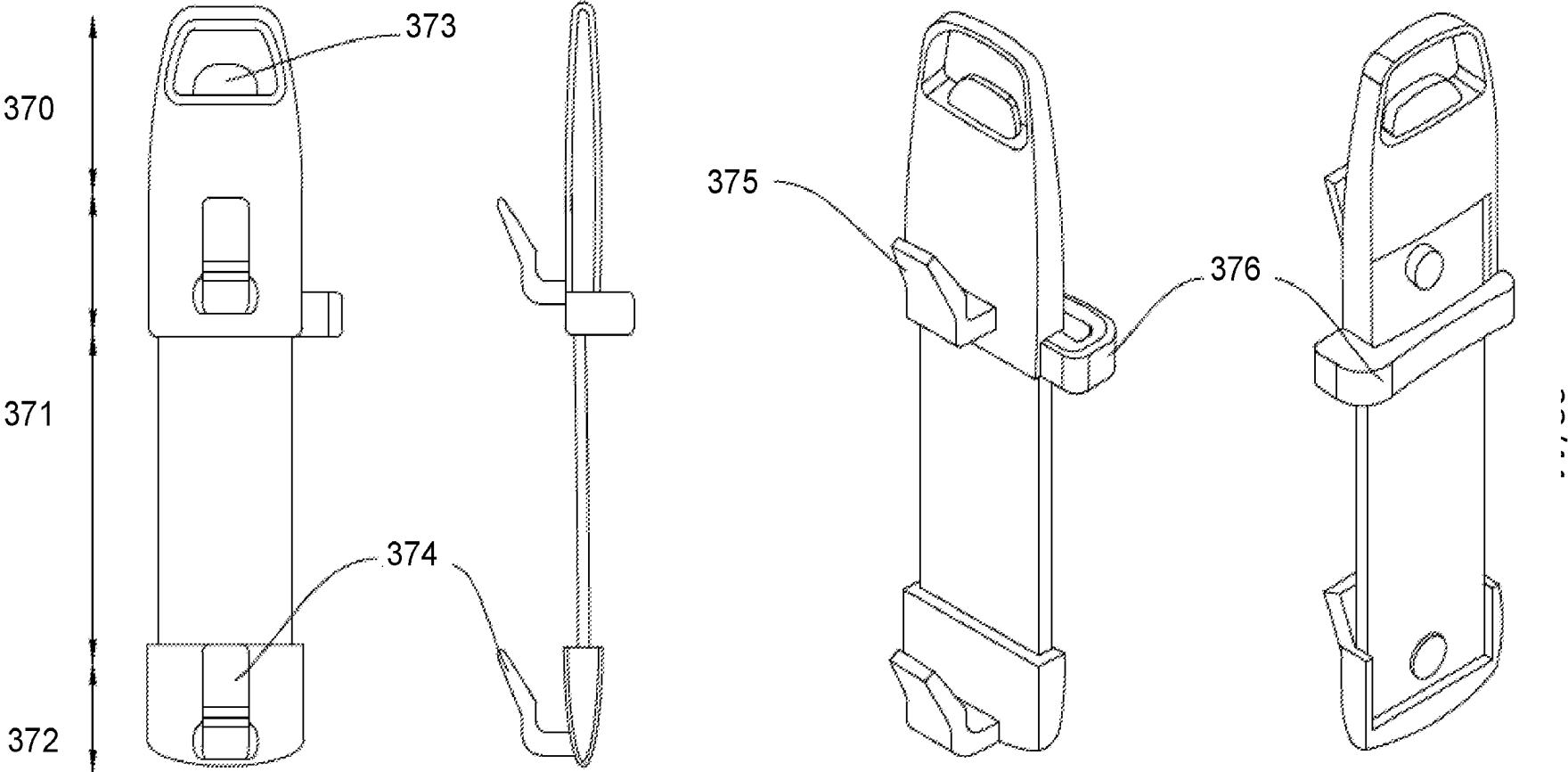


FIGURE 38

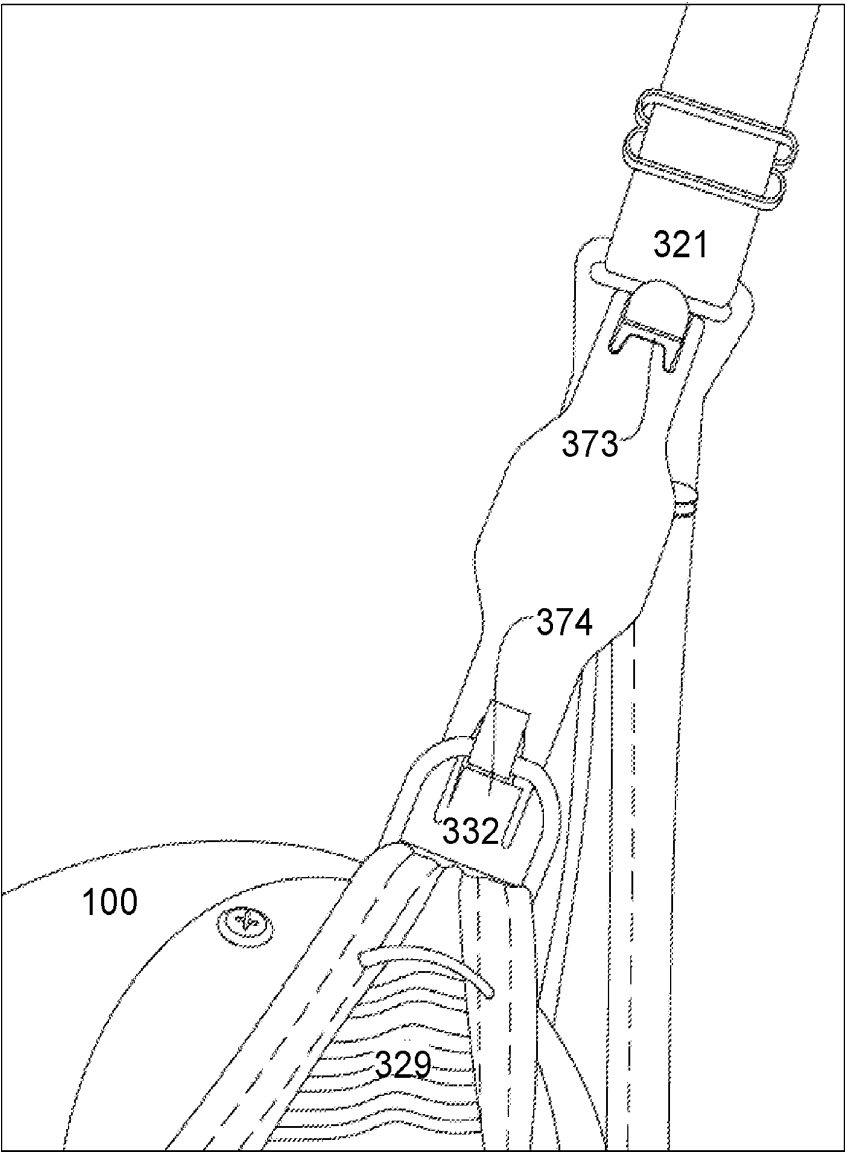


FIGURE 39

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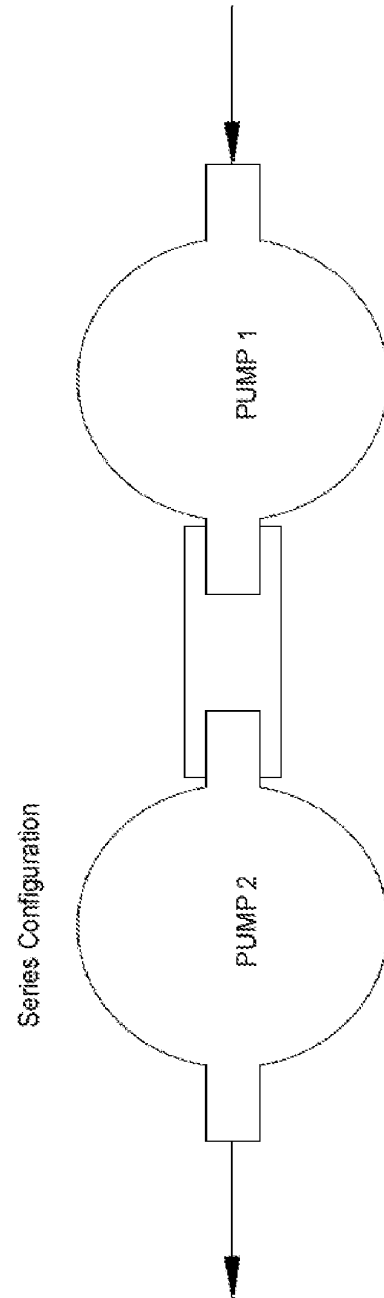


FIGURE 40



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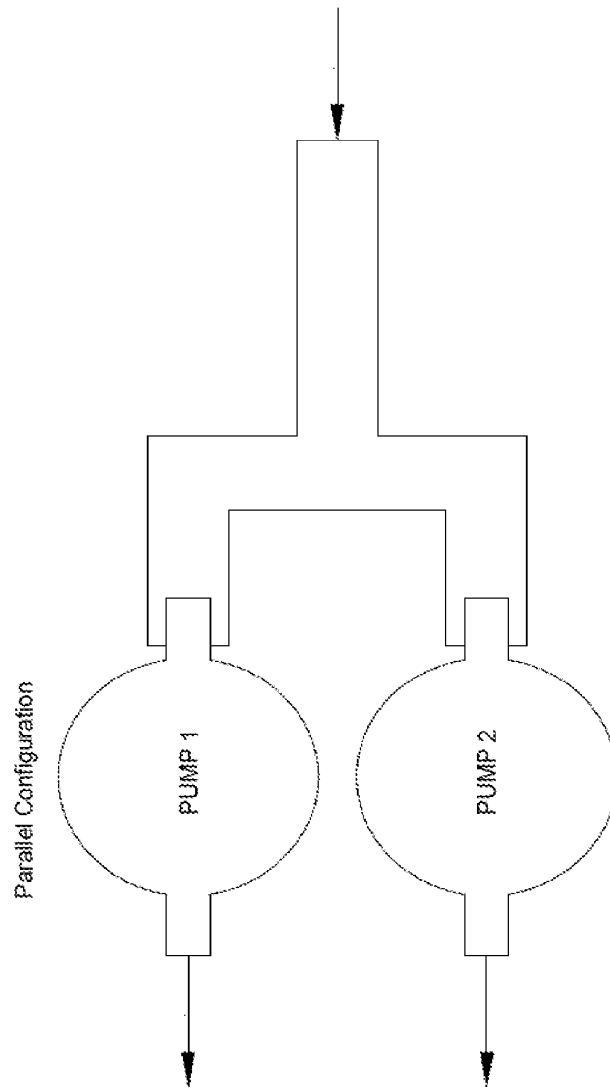


FIGURE 41

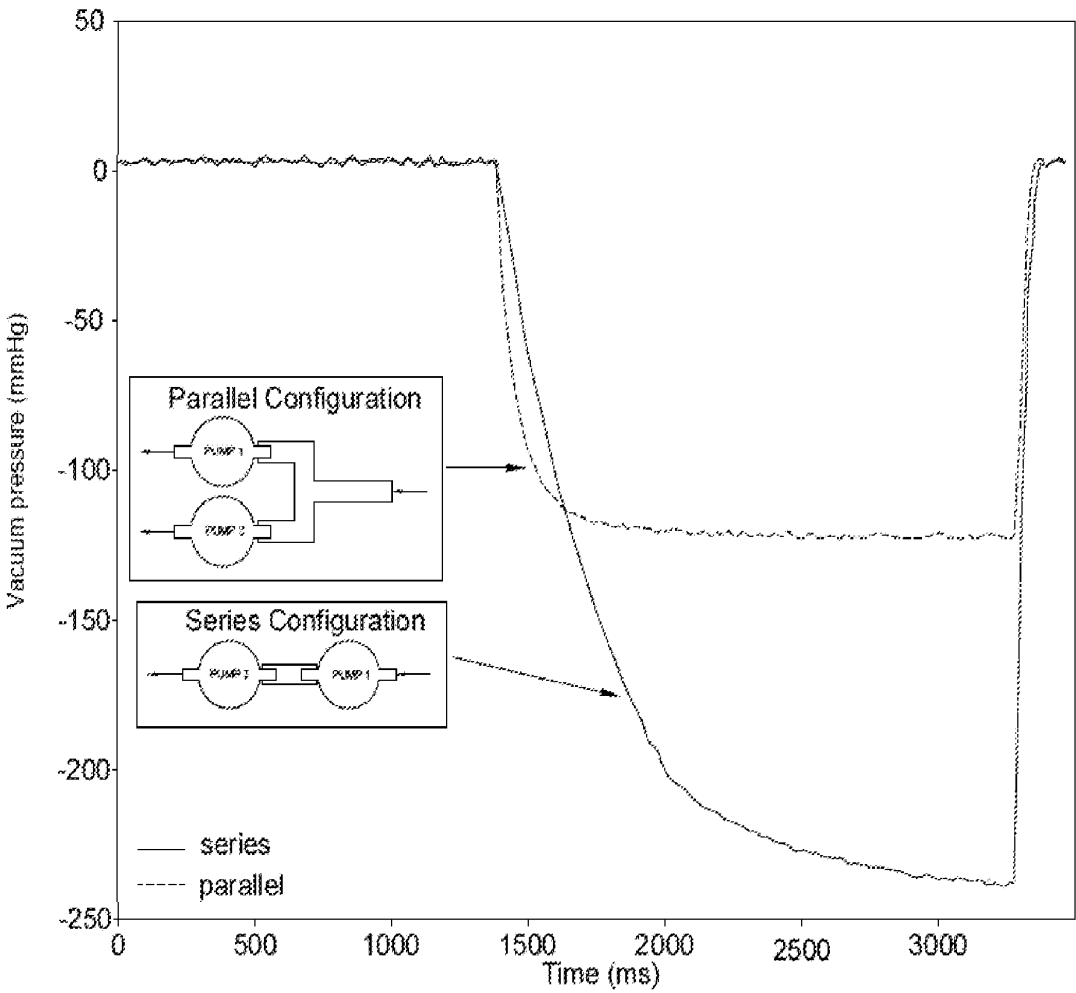


FIGURE 42

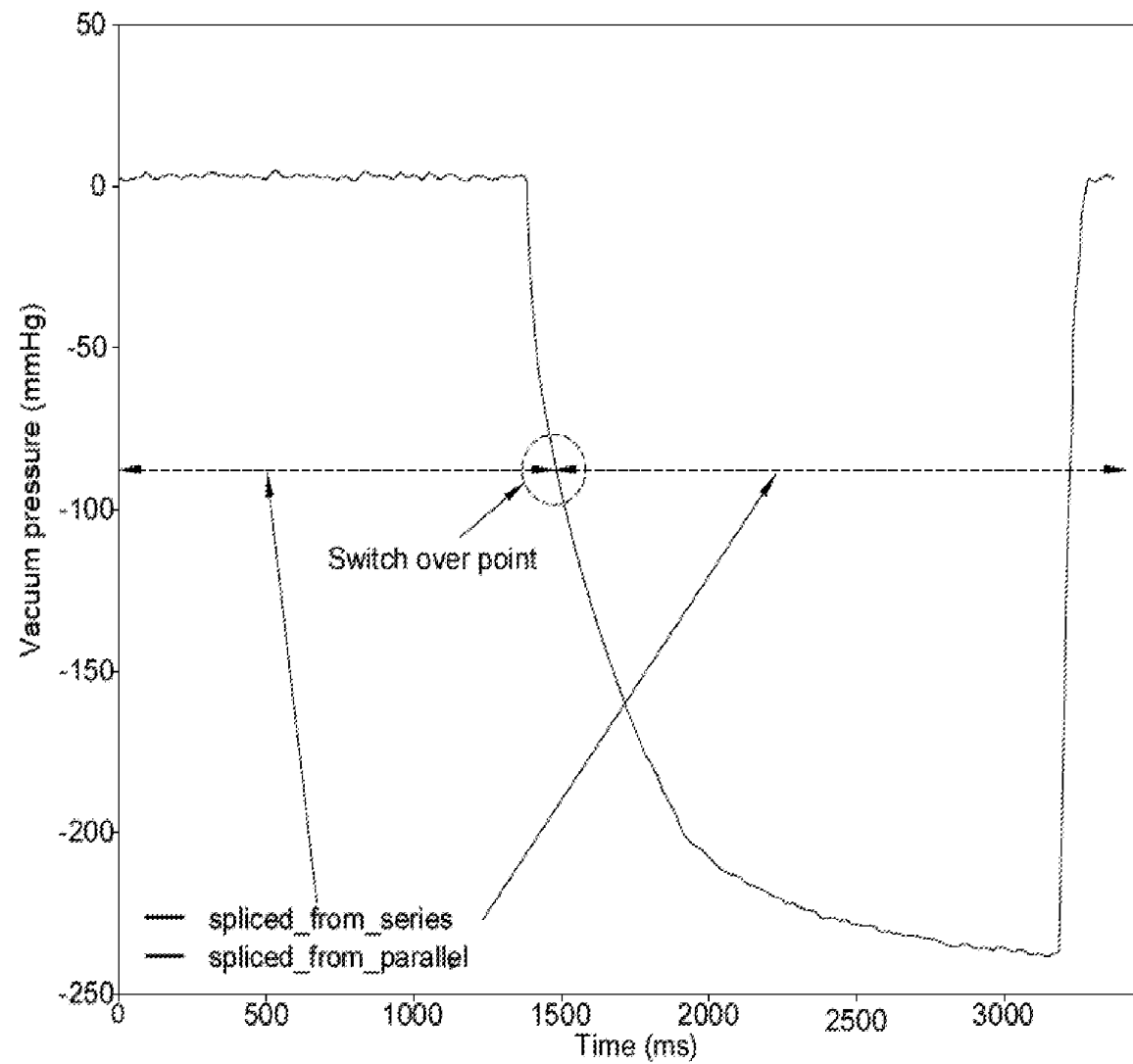


FIGURE 43

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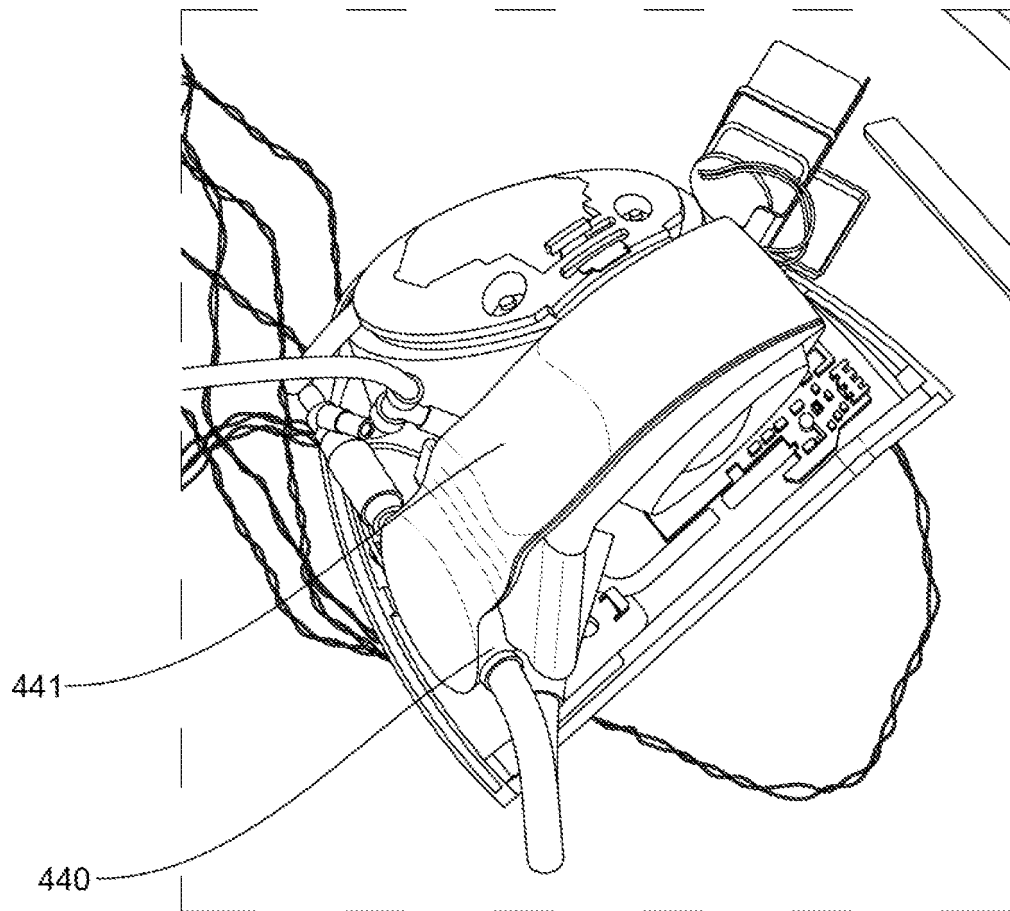


FIGURE 44

DocCode – SCORE

## **SCORE Placeholder Sheet for IFW Content**

Application Number: 17181057

Document Date: 02/22/2021

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

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- Drawing

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
17/181,057	02/22/2021	3783	1540	373499.00049	30	1

CONFIRMATION NO. 4690

## FILING RECEIPT



CC000000123774298

78905

Saul Ewing Arnstein & Lehr LLP (Philadelphia)  
 Attn: Patent Docket Clerk  
 Centre Square West  
 1500 Market Street, 38th Floor  
 Philadelphia, PA 19102-2186

Date Mailed: 03/03/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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**Inventor(s)**

Jonathan O'TOOLE, London, UNITED KINGDOM;  
 Adam ROLLO, London, UNITED KINGDOM;  
 Andrew CARR, London, UNITED KINGDOM;

**Applicant(s)**

CHIARO TECHNOLOGY LIMITED, London, UNITED KINGDOM;

**Power of Attorney:** The patent practitioners associated with Customer Number 78905

**Domestic Priority data as claimed by applicant**

This application is a CON of 16/009,547 06/15/2018 PAT 10926011

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

UNITED KINGDOM 1709561.3 06/15/2017 Access Code Provided  
 UNITED KINGDOM 1709564.7 06/15/2017 Access Code Provided  
 UNITED KINGDOM 1709566.2 06/15/2017 Access Code Provided  
 UNITED KINGDOM 1809036.5 06/01/2018 Access Code Provided

**Permission to Access Application via Priority Document Exchange:** Yes

**Permission to Access Search Results:** Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

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**If Required, Foreign Filing License Granted:** 03/02/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/181,057**

**Projected Publication Date:** 06/10/2021

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

BREAST PUMP SYSTEM

**Preliminary Class**

604

**Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:** No

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### **Title 37, Code of Federal Regulations, 5.11 & 5.15**

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**PATENT APPLICATION FEE DETERMINATION RECORD**

Substitute for Form PTO-875

Application or Docket Number  
17/181,057**APPLICATION AS FILED - PART I**

(Column 1)

(Column 2)

**SMALL ENTITY**

OR

**OTHER THAN  
SMALL ENTITY**

FOR		NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A
SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A
TOTAL CLAIMS (37 CFR 1.16(i))		30 minus 20 =	* 10
INDEPENDENT CLAIMS (37 CFR 1.16(h))		1 minus 3 =	*
APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			

RATE(\$)	FEE(\$)
N/A	80
N/A	350
N/A	400
x 50 =	500
x 240 =	0.00
	210
	0.00
TOTAL	1540

RATE(\$)	FEE(\$)
N/A	
N/A	
N/A	
TOTAL	

\* If the difference in column 1 is less than zero, enter "0" in column 2.

**APPLICATION AS AMENDED - PART II**

(Column 1)

(Column 2)

(Column 3)

**SMALL ENTITY**

OR

**OTHER THAN  
SMALL ENTITY**

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

\*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.



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Application number: 1709566.2

Date of availability of document: 27 Jul 2017 (27.07.2017)

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Date of issue of this certificate: 03 Mar 2021 (03.03.2021)

Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

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Dated 19 June 2017

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 1017015616 D02882  
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Patents Act 1977 (Rule 12)

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Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

**Application number** GB 1709566.2

1. Your reference	<b>MJD/P153992GB00</b>		
2. Full name, address and postcode of the applicant or of each applicant	<b>CHIARO TECHNOLOGY LIMITED</b> <b>Second Floor 63-66 Hatton Garden</b> <b>London EC1N 8LE</b> <b>Greater London</b> <b>United Kingdom</b> <b>11287869002</b>		
Patents ADP number (if you know it)			
3. Title of the invention	<b>BREAST PUMP</b>		
4. Name of your agent (if you have one)	<b>Boult Wade Tennant</b> <b>Boult Wade Tennant</b> <b>Verulam Gardens</b> <b>70, Gray's Inn Road</b> <b>London WC1X 8BT</b> <b>United Kingdom</b> <b>42001</b>		
"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)			
Patents ADP number (if you know it)			
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
	Country	Application number	Date of filing
6. Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application			PDAS Access Code
		Number of earlier UK application	Date of filing (day / month / year)
7. Inventorship: (Inventors must be individuals not companies)			
Are all the applicants named above also inventors?	<b>No</b>		
8. Are you paying the application fee with this form?	<b>Yes</b>		

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**Patents Form 1(e)**

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9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description: **20**

Claim(s): **6**

Abstract: **n/a**

Drawing(s): **13**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	PDAS Access Code
---------	--------------------	----------------	------------------

10. If you are also filing any of the following, state how many against each item.

Priority documents: **0**

Statement of inventorship and right to grant of a patent  
(Patents Form 7): **1**

Request for search (Patents Form 9A): **1**

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11. I/We request the grant of a patent on the basis of this application.

Signature: **/DRAPER, Martyn John/**

Date: **15 Jun 2017**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

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## BREAST PUMP

### BACKGROUND

A breast pump is a mechanical device that extracts milk from the breasts of a lactating woman.

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The typical breast pump design is as shown in WO 96/25187 A1. A large suction generating device is provided, which is freestanding. This is attached by air lines to one or two breast shields which engage with the user's breasts. A pressure cycle is applied from the suction generating device, via the air lines, to the breast shields. This generates a pressure cycle on the user's breasts to simulate the suction generated by a feeding child. The suction generating device is a large component that connects to mains power to operate the pumps therein.

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Milk collection bottles are provided to store the expressed breast milk. In the system of WO 96/36298 A1 separate bottles are provided attached to each breast shield. However, in alternative embodiments there may be a single bottle with tubing connecting the breast shields thereto. For a mother to use this somewhat discretely, such as in an office environment, specialised bras must be used. In particular, breast-pumping bras which have a central slit, for the spout of the breast shield to extend through are typically used. The breast shield is held within the bra, with the suction generating device and milk bottle outside the bra.

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The fundamental breast pump system has not been significantly altered from this, with minor technical improvements being the main developments.

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However, these systems present a number of significant disadvantages. As the suction generating device is a large freestanding unit connected to the mains power, the user may feel tethered to the wall. The devices also require a specific user posture and undressing to function normally. This is obviously difficult for a user to do discretely, such as in an office setting.

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Fully integrated wearable breast pumps have begun to enter the market, such as US 2016 206794 A1. In such pumps, the suction source, power supply and milk container are locally provided, without the need for bulky external components or connections. Such devices can be provided with a substantially breast shaped profile so as to fit within a

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user's bra for discrete pumping, as well as pumping on-the-go without any tethers to electrical sockets or collection stations.

5 In US 2016 206794 A1, the breast pump has an offset shape favouring the lower half of the pump, and requires complex collapsible bag systems as milk collection devices. This is to force the pump to fit within the user's existing bras.

10 As the collection bag systems are collapsible, it will be very difficult for a user to extract all of their milk from the bag due to the small cut opening and capillary action between the bonded plastic sheets. This waste can be disheartening for the user as this is food for their child. The bags are also not re-usable, so the user is required to purchase and maintain a stock of these. As well as presenting a recurring cost, if the user runs out of stock they are unable to use the product until more bags are purchased.

15 Furthermore, as a result of the collapsible bags, a complex pumping arrangement is necessary. In particular, the breast shield connects to a tube which is provided with a plurality of compression units which "step" the expressed milk through the tube to the collection bag. This uses the breast milk as a hydraulic fluid to generate suction on the breast. In order to carry this out, a complex sequenced pulsing arrangement must be  
20 implemented.

In addition to these systems being particularly complex and wasteful, a relatively small bag must be used. In US 2016 206794, approximately 110 ml (4 fluid ounces) of milk can be collected before the bag must be changed. While this may be sufficient for some  
25 users, others may produce much more milk in a session.

A further integrated wearable breast pump is shown in US 2013 0023821 A1. In the third embodiment in this document, an integral breast pump is provided including a motor driven vacuum pump and power source. An annular (or punctured disc) membrane is provided,  
30 with the flow path of the milk going through the centre of the annulus. The membrane is housed in separate housing components and is sealed at its inner and outer edges. The breast shield has a small protrusion to engage with these housing components. However, the design of this breast pump results in a number of problems. The use of an annular membrane, with the fluid flow path running through the opening of the annulus is  
35 undesirable as it results in a large and bulky device.



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There is therefore a need for improved integrated breast pump systems.

#### SUMMARY OF THE INVENTION

A breast pump according to a first embodiment of the present invention is provided according to claim 1. This breast pump is for wearing inside a bra, and comprises: a breast shield for engagement with the user's breast; a housing for receiving at least a portion of the breast shield; a pump inside the housing for generating a negative pressure in the breast shield; a battery inside the housing for powering the pump; a detachable rigid milk collection container attachable, in use, to a lower face of the housing and being in connected to the breast shield for collecting milk expressed by the user, with a milk-flow pathway defined from an opening in the breast shield to the milk collection container; and a barrier, the pump acting on one side of the barrier to generate a pressure on the opposite, milk-flow side of the barrier, the barrier having an outer periphery, wherein: the shield, housing, pump, battery and container are provided as a unit with a convex outer surface contoured to fit in a bra; and the milk-flow pathway extends past the outer periphery of the barrier.

This breast pump allows discrete wearing and use, which can fit within a user's bra. The milk-flow path extending past the outer periphery of the barrier allows for a simpler and more robust design, without the milk-flow pathway extending through the barrier. This provides increased interior space and functionality of the device.

A breast pump according to a second embodiment of the present invention is provided according to claim 2. The breast pump is for wearing inside a bra, the breast pump comprising: a breast shield for engagement with the user's breast; a housing for receiving at least a portion of the breast shield; a pump inside the housing for generating a negative pressure in the breast shield; a battery inside the housing for powering the pump; a detachable rigid milk collection container attachable, in use, to a lower face of the housing and connected to the breast shield for collecting milk expressed by the user with a milk-flow pathway defined from an opening in the breast shield to the milk collection container, wherein: the shield, housing, pump, battery and container are provided as a unit with a convex outer surface contoured to fit in a bra; and the breast shield comprises a shield flange for engaging the user's breast, and an elongate spout aligned with the opening and extending away from the user's breast, the spout being substantially aligned, in use, with the user's nipple and areolae; the spout comprising a first opening for depositing milk into

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the collection container and a second opening for transferring pressure generated by the pump to the user's nipple, the shield flange and spout being detachable from the housing together.

5           This breast pump allows discrete wearing and use, which can fit within a user's bra. The shield flange and spout being detachable together helps further simplify the design, and reduce the number of components which must be removed for cleaning and sterilisation.

10           A breast pump according to a third embodiment of the present invention is provided according to claim 3. This breast pump is for wearing inside a bra, and comprises: a breast shield for engagement with the user's breast; a housing for receiving at least a portion of the breast shield; a piezo pump inside the housing for generating a negative pressure in the breast shield; a battery inside the housing for powering the pump; a detachable milk  
15 collection container attachable, in use, to a lower face of the housing and connected to the breast shield for collecting milk expressed by the user with a milk-flow pathway defined from an opening in the breast shield to the milk collection container, wherein the shield, housing, pump, battery and container are provided as a unit with a convex outer surface contoured to fit in a bra.

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          This breast pump allows discrete wearing and use, which can fit within a user's bra. The piezo pump is ideally suited for this environment as it is low noise and high strength with a compact size.

25           The breast shield of embodiments 1 or 3 may further comprise a shield flange for engaging the user's breast, and an elongate spout aligned with the opening and extending away from the user's breast, the spout being substantially aligned, in use, with the user's nipple and areolae; the spout comprising a first opening for depositing milk into the collection container and a second opening for transferring pressure generated by the pump  
30 to the user's nipple.

          The shield flange and spout may be detachable from the housing together. Preferably, the spout will be integral with the breast shield. This helps to simplify the design and reduce the number of components which must be removed for cleaning and  
35 sterilisation.

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The breast shield cup may extend over a majority of the inner surface of the unit, preferably the breast shield extends over 80% of the inner surface of the unit. This reduces the risk of milk contacting a part of the device which cannot be easily sterilised. This also helps to disperse the pressure applied to the user's breast across a larger area. Additionally, by covering the majority of the inner surface, the breast shield is the only component which contact's the wearer's breast. This leaves fewer surfaces which require thorough cleaning.

10 The spout may connect directly to the container. By reducing the distance covered by the milk, the device is reduced in size and complexity of small intermediate portions.

The spout may comprise an opening directly above the milk collection container. By reducing the distance covered by the milk, the device is reduced in size and complexity of small intermediate portions.

The breast pump of the second or third embodiments may further comprise a barrier mounted in the breast pump, the pump acting on one side of the barrier to generate a pressure on the opposite, milk-flow, side of the barrier.

20 Preferably, the barrier has an outer periphery and the milk-flow pathway extends past the outer periphery of the barrier. This allows for a simpler and more robust design, without the milk-flow pathway extending through the barrier.

25 Preferably the milk-flow pathway extends beneath the barrier. This provides an added benefit of having gravity tend the milk away from the barrier.

Preferably the milk-flow pathway does not pass through the barrier. This results in a simpler and smaller barrier design.

30 Preferably, the barrier is mounted on a housing on the breast shield. More preferably, the housing is integral with the breast shield. This further helps increase the ease of cleaning and sterilisation as all of the components on the "dirty" side can be removed.

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Preferably, the barrier is not an annulus.

The barrier may provide a seal to isolate the pump from the milk-flow side of the barrier. This helps to avoid the milk becoming contaminated from the “dirty” airflow side.

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Preferably, the only seal is around an outer edge of the barrier. This is a simple design as only a single seal needs to be formed and maintained. Having multiple seals, such as for an annular membrane, introduces additional complexity and potential failure points.

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Preferably, the barrier is a diaphragm.

Preferably, the diaphragm is a continuous membrane which is devoid of any openings or holes. This provides a larger effective “working” area of the diaphragm (i.e. the area of the surface in contact with the pneumatic gasses) than an annular membrane and hence the membrane may be smaller to have the same working area.

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The breast pump may further comprise a pressure sensor in pneumatic connection with the piezo pump. This allows the output of the pump to be determined.

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Preferably, the width of the breast pump is less than 110 mm.

Preferably, the height of the breast pump is less than 180 mm.

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Preferably, the plane to plane depth of the breast pump less than 100 mm.

Preferably, in use, the breast pump extends from the user’s breasts by between 3 to 4 cup sizes as per the European standard EN 13402.

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Preferably, the milk container has a volume of greater than 120 ml. More preferably, the milk container has a volume of greater than 140 ml.

Preferably, the milk container has a volume of less than 150 ml.

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The milk container and housing may form a substantially continuous outer surface of the breast pump. This helps ensure that the breast pump in use fits within a conventional bra system discretely.

5           The milk container may be at least partially transparent on the outer surface of the breast pump. This allows the level of milk within the container to be easily observed even while pumping.

10           The milk container may be provided with a spout. This makes it easier for the end user to pour the collected milk into other containers for use or storage.

15           The milk container may be provided with attachment means for attaching a teat to the container. This allows the milk container to be used directly as a drinking vessel for a child.

            The breast shield may be removable. This allows the shield to be easily washed and sterilised.

20           The milk collection container may be formed of at least two rigid sections which are connectable. This allows simple cleaning of the container for re-use.

            The breast pump may further comprise a one-way valve between an inner surface of the breast shield, for engaging with the breast in use, and the milk container.

25           The one-way valve may be located in an opening to the container.

            The pump of the first or second embodiments may be a piezo pump.

30           The breast shield may be detachable from the breast pump.

            The breast pump of the may further comprise a single pole, double throw pneumatic valve, wherein: the pole is in pneumatic connection with the pump and pressure sensor; one of the throws is in pneumatic connection with the diaphragm; and the other throw is in pneumatic connection with a dead-end.

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The breast pump may further comprise: a first non-return valve between the milk-flow side of the diaphragm and the breast shield, configured to allow only a negative pressure to be applied to the breast shield by the pump; a second non-return valve between the milk-flow side of the diaphragm and the milk collection container configured to allow only a positive pressure to be applied to the milk collection container by the pump; and a pressure sensor in pneumatic connection with the pressure-generation side of the diaphragm.

A method of estimating the pressure applied by a breast pump according to an aspect of the present invention is provided according to claim 42, comprising the steps of: providing a breast pump according to the third embodiment; selecting a pressure cycle from a pre-defined list of pressure cycles; applying pressure with the pump to stimulate milk expression; reading the output of the pressure sensor; and adjusting the applied pressure of the pump to match the pressure profile selected. This allows for repeatable application of force to the breast, even as the pump performance degrades.

Preferably the method further comprises the steps of: approximating the elasticity and extension of the diaphragm at the relevant pressure; and calculating an estimated applied pressure based upon the output of the pressure sensor and the approximated elasticity and extension of the diaphragm.

A method of estimating the milk collected by a breast pump according to an aspect of the present invention is provided according to claim 44, comprising the steps of: providing a breast pump according to claim 33; generating a positive pressure with the pump; transmitting the positive pressure via the diaphragm and second non-return valve to only the milk collection container; measuring the increase in pressure by the pressure sensor in pneumatic connection with the diaphragm; estimating the volume of milk inside the milk collection container based upon the rate of increase of pressure. In this manner, the volume of milk can be estimated remotely.

#### DESCRIPTION OF THE FIGURES

The invention will now be described with respect to the Figures in which:

Figure 1 is a front view of an assembled breast pump;

Figure 2 is a rear view of the assembled breast pump of Figure 1;

Figure 3 is a front view of a partially disassembled breast pump;

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Figure 4 is a rear view of the partially disassembled breast pump of Figure 3;

Figure 5 is a front view of a further partially disassembled breast pump;

Figure 6 is a rear view of the further partially disassembled breast pump of Figure 5;

Figure 7 is a front view of the breast pump of Figure 1, with the outer shell

5 translucent for ease of explanation;

Figure 8 is a further front view of the breast pump of Figure 1, with the front of the outer shell removed for ease of explanation;

Figure 9 is a schematic view of a spout for a breast shield;

Figure 10 is a schematic of a pneumatic system for a breast pump;

10 Figure 11 is a schematic of an alternative pneumatic system for a breast pump;

Figure 12 is a schematic of a further alternative pneumatic system for a breast pump; and

Figure 13 is a graph depicting measured pressure in the breast pump system of Figure 12 over time.

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#### DETAILED DESCRIPTION

Figure 1 is a front view of a breast pump 100 according to the present invention. The breast pump 100 comprises a housing 1 and a milk collection container (or bottle) 3. The milk collection container 3 is attached to a lower face 1A of the housing 1. While the  
20 breast pump 100 may be arranged to be used with one of the right or the left breast specifically, it is preferred the breast pump 100 can be used with either breast without modification. To this end, the outer surfaces of the breast pump 100 are preferably substantially symmetrical

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The breast pump 100 is further provided with a user interface 5. This may take the form of a touchscreen and/or physical buttons. In particular, this may include buttons, sliders, any form of display, lights, or any other componentry necessary to control and indicate use of the breast pump 100. Such functions might include turning the breast pump 100 on, specifying which breast is being pumped, or increasing the peak pump pressure.  
30 Alternatively, the information provided through the user interface 5 might also be conveyed through haptic feedback, such as device vibration, driven from a miniature vibration motor within the pump housing 1.

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In the particular embodiment of the Figures, the user interface 5 comprises power button 5A for turning the pump on and off. The user interface 5 further comprises pump up

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button 5B and pump down button 5C. These buttons adjust the pressure generated by the pump and hence applied to the user's breast. In preferable embodiments, the pump up button 5B is physically larger than the pump down button 5C. A play/pause button 5D is provided for the user to interrupt the pumping process without turning the device on and off.

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The user interface 5 further comprises a breast toggle button 5E for the user to toggle a display of which breast is being pumped. This may be used for data collection, which is discussed in more detail later, or for the user to keep track of which breast has most recently been pumped. In particular, there may be a pair of LEDs, one to the left of the toggle button 5E and one to the right. When the user is pumping the left breast, the LED to the right of the toggle button 5E will illuminate, so that when the user looks down at the toggle it is the leftmost LED from their point of view that is illuminated. When the user then wishes to switch to the right breast, the toggle button can be pressed and the LED to the left of the toggle button 5E will illuminate.

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As depicted in Figure 1, the housing 1 and milk collection container 3 form a substantially continuous outer surface, with a generally convex shape. This shape roughly conforms with the shape of a breast. This allows the breast pump 100 to fit within the cup of a user's bra. The milk collection container 3 is retained in attachment with the housing 3 by means of a latch system, which is released by button 2.

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The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting an additional 2 cm difference. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes of S, M, L, XL, etc. In preferred embodiments, the breast pump 100 of the present invention corresponds to an increase of between 3 or 4 cup sizes of the user according to EN 13402.

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A plane-to-plane depth of the breast pump can also be defined. This is defined as the distance between two parallel planes, the first of which is aligned with the innermost point of the breast pump 100, and the second of which is aligned with the outermost point of the breast pump 100. This distance is preferably less than 100 mm.

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Figure 2 is a rear view of the breast pump 100 of Figure 1. The inner surface of the housing 1 and milk collection container 3 are shown, along with a breast shield 7. The

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housing 1, milk collection container 3 and breast shield 7 form the three major sub-components of the breast pump 100. In use, these sub-components clip together to provide the functioning breast pump 100. The breast shield 7 is designed to engage with the user's breast, and comprises a concave inner flange 7A which contacts the breast. To allow the  
5 breast pump 100 to be used on either of the user's breasts, the breast shield 7 is preferably substantially symmetrical on its inner flange 7A.

The inner flange 7A is substantially oval-shaped. While the inner flange 7A is concave, it is relatively shallow such that it substantially fits the body form of the user's  
10 breast. In particular, when measured side-on the inner-most point of the flange 7A and the outer-most point may be separated by less than 25 mm. By having a relatively shallow concave surface, the forces applied can be spread out over more surface area of the breast. The flatter form also allows easier and more accurate location of the user's nipple. In particular, the flange 7A of the breast shield 7 may extend over the majority of the inner  
15 surface of the housing 1 and milk collection container 3. Preferably, it may extend over 80% of this surface.

The breast shield 7 substantially aligns with the outer edge 1B of the housing 1. The milk collection container 3 may be provided with an arcuate groove for receiving a lower  
20 part of the breast shield 7. This is best shown in later Figures. In the assembled arrangement of Figures 1 and 2, the inner surface of the breast pump 100 is substantially continuous.

The breast shield 7 further comprises a spout 9 extending from an opening 7B in  
25 the breast shield 7. In preferable embodiments the spout 9 is integral with the breast shield 7. However, it is appreciated that separate removable/interchangeable spouts may be used. The opening 7B is aligned with the user's nipple and areola in use. The breast shield 7 forms an at least partial seal with the rest of the user's breast around this portion. This spout 9 defines a milk-flow path from the inner surface of the breast shield 7A, through the  
30 spout 9 and into the milk collection container 3. The spout 9 is preferably quite short in order to minimise the length of the milk-flow path in order to minimise losses. In particular, the spout 9 may extend less than 70 mm from its start to end, more preferably less than 50 mm,

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Figures 3 and 4 are of a partially disassembled breast pump 100 of the present invention. In these Figures, the breast shield 7 has been disengaged from the housing 1 and milk collection bottle 3. As shown in Figure 4, the housing 1 comprises a slot 11 for receiving the spout 9 of the breast shield 7. The breast shield 7 is held in place by means of a clip 15 engaging with a slot 17 in the housing 1. While this clip 15 is shown at the top of the breast shield 7, it may be placed at any suitable point on the shield 7, with the slot 17 in a corresponding location. The spout 9 of the breast shield 7, is provided with a protrusion 9A on its lower surface. This protrusion 9A is configured to engage with the milk collection bottle 3.

The breast pump 100 further comprises a barrier for transferring the pressure from the pump to the milk-collection side of the system. In the depicted example, this is flexible diaphragm 13. However, it is appreciated that the barrier could be any other suitable component such as a filter or an air transmissive material.

The diaphragm 13 is arranged so that the milk-flow pathway extends past the outer periphery of the diaphragm 13. This means that the milk-flow pathway does not extend through the diaphragm 13. In particular, the milk-flow pathway is beneath the diaphragm 13. However, it is appreciated that the diaphragm 13 may be offset in any direction with respect to the milk-flow pathway provided that the milk-flow pathway does not extend through the diaphragm 13.

Preferably, the diaphragm 13 is a continuous membrane, devoid of any openings.

The diaphragm 13 is held in a diaphragm housing 19, which is formed in two parts. The first half 19A of the diaphragm housing 19 is provided on the outer surface of the breast shield 7, above the spout 9 and hence the milk-flow pathway. In preferred embodiments, the first half 19A of the diaphragm housing 19 is integral with the breast shield. The second half 19B of the diaphragm housing is provided in a recessed portion of the housing 1. The diaphragm 13 seals in this diaphragm housing 19 around its outer edge, to form a watertight and airtight seal. Preferably, the seal around the outer edge of the diaphragm 13 is the only seal of the diaphragm 13. This is beneficial over systems with annular diaphragms which must seal at an inner edge as well. Having the diaphragm 13 mounted in the breast pump 100 in this manner ensures that it is easily accessible for

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cleaning and replacement. It also ensures that the breast shield 7 and diaphragm 13 are the only components which need to be removed from the pump 100 for cleaning.

Figures 5 and 6 show a breast pump 100 according to the present invention in a further disassembled state. In addition to the breast shield 7 and diaphragm 13 being removed, the milk collection container 3 has been unclipped.

Preferably, the milk collection container 3 is a substantially rigid component. This ensures that expressed milk does not get wasted therein, while also enhancing re-usability. In some embodiments, the milk collection container 3 may be formed of three sections: a front bottle portion, a rear bottle portion, and a cap. These three sections may clip together to form the milk collection container 3. This three part system is easy to empty, easily cleanable, and easily re-usable.

However, in the preferred embodiments the milk bottle 3 is a single integral part with a cap 35. The milk collection container 3 has a capacity of approximately 5 fluid ounces (148 ml).

To achieve this, the milk collection container 3 preferably has a depth in a direction extending away from the breast in use, of between 50 to 80 mm, more preferably between 60 mm to 70 mm, and most preferably between 65 mm to 68 mm.

The milk collection container 3 further preferably has a height, extending in the direction from the bottom of the container 3 in use to the cap 35, of between 40 mm to 60 mm, more preferably between 45 mm to 55 mm, and most preferably between 48 mm to 52 mm.

Further preferably, the milk collection container has a length, extending from the leftmost point to the rightmost point of the container 3 in use, of between 100 mm to 120 mm, more preferably between 105 mm to 115 mm, and most preferably between 107 mm to 110 mm.

This cap 35 is provided with a one-way valve 37, through which milk can flow. This valve 37 prevents milk from spilling from the bottle once it has been collected. In addition, the valve 37 automatically seals completely unless engaged to the breast shield 7. This

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ensures that when the pump 100 is dismantled immediately after pumping, no milk is lost from the collection bottle 3. It can be appreciated that this one-way valve 37 might also be placed on the breast shield 7 rather than in this bottle cap 35. The cap 35 may screw into the milk collection bottle 3. In particular, it may be provided with a threaded connection or a bayonet and slot arrangement.

In certain embodiments, a teat may be provided to attach to the annular protrusion 31A to allow the container 3 to be used directly as a bottle. Alternatively, or in addition, a spout may be provided to attach to the protrusion 31A for ease of pouring.

Figures 7 and 8 show front views of a breast pump 100 according to the present invention. The outer-surface of the housing 1 has been drawn translucent to show the components inside. The control circuitry 71 for the breast pump 100 is shown in these figures. The control circuitry in the present embodiment comprises four separate printed circuit boards, but it is appreciated that any other suitable arrangement may be used.

The control circuitry may include sensing apparatus for determining the level of milk in the container 3. The control circuitry may further comprise a wireless transmission device for communicating over a wireless protocol (such as Bluetooth) with an external device. This may be the user's phone, and information about the pumping may be sent to this device. In embodiments where the user interface 5 comprises a breast toggle button 5E, information on which breast has been selected by the user may also be transmitted with the pumping information. This allows the external device to separate pumping data for the left and right breasts.

There should also be charging means within the control circuitry 71 for charging the battery 81. While an external socket, cable or contact point may be required for charging, a form of wireless charging may instead be used such as inductive or resonance charging. In the Figures, charging port 6 is shown for charging the battery 81. This port 6 may be located anywhere appropriate on the housing 1.

Figure 8 shows the location of the battery 81 and the pumps 83A, 83B mounted in series inside the housing 1. While the depicted embodiment shows two pumps 83A, 83B it is appreciated that the present invention may have a single pump.

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Preferably, an air filter 86 is provided at the output to the pumps 83A, 83B. In preferable embodiments, the pumps 83A, 83B are piezoelectric pumps (or piezo pump). A suitable piezo pump is manufactured by TTP Ventus, which can deliver in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free flow.

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The rear side of the second half of the diaphragm housing 19B in the housing 1 is provided with a pneumatic connection spout. The pumps 83A, 83B are pneumatically connected with this connection spout.

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Operation of the breast pump 100 will not be described. Once the breast pump 100 is activated and a pumping cycle is begun, the pumps 83A, 83B generates a negative pressure which is transmitted via the connection spout 85 to a first side of the diaphragm 13 in the diaphragm housing 19. This side of the diaphragm 13 is denoted the pumping side 13B of the diaphragm 13.

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The diaphragm 13 transmits this negative pressure to its opposite side (denoted the milk-flow side 13A). This negative pressure is transferred from the first side of the diaphragm housing 19A to the opening 7B of the breast shield 7 via the spout 9. This acts to apply the pressure cycle to the breast of the user, in order to express milk. The milk is then drawn through the spout 9, through the one way valve 37 and into the milk collection container 3. The negative pressure is then released, and periodically reapplied in a manner to imitate the sucking of a child.

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While the depicted embodiment of the breast pump 100 is provided with two pumps, the following schematics will be described with a single pump 83. It is understood that the single pump 83 could be replaced by two separate pumps 83A, 83B as above.

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Figure 9 depicts a schematic of a further embodiment of a spout 9 for a breast pump 100. The spout 9 is provided with an antechamber 91 and a separation chamber 93. A protrusion 95 extends from the walls of the spout 9 to provide a tortuous air-liquid labyrinth path through the spout 9. In the separation chamber 93 there are two opening 97, 99. An air opening 97 is provided in an upper surface 93A of the separation chamber 93. This upper surface 93 is provided transverse to the direction of the spout 9. This opening 97 connects to the first side of the diaphragm housing 19A and is the source of the negative pressure. This airflow opening 97 also provides a route for air to flow as shown

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with arrow 96. It is appreciated that the tortuous pathway is not necessary and that a spout 9 without such a pathway will work.

5 The other opening 99 is a milk opening 99. The milk opening 99 is provided on a lower surface 93B of the separation chamber 93 and connects in use to the container 3. After flowing through the tortuous spout 9 pathway, the milk is encouraged to flow through this opening 99 into the container 3. This is further aided by the transverse nature of the upper surface 93A.

10 In this manner, expressed milk is kept away from the diaphragm 13. As such, the breast pump 100 can be separated into a “clean” air-flow side comprising the pump 83, the connection spout 85 and the pumping side 13B of the diaphragm 13 and a “dirty” milk-flow side comprising the breast shield 7, the milk collection container 3 and the milk-flow side 13A of the diaphragm 13. This ensures that all of the “dirty” components are easily  
15 detachable for cleaning, maintenance and replacement. Additionally, the milk is kept “clean” by ensuring it does not contact the mechanical components.

While the present embodiment discusses the generation of negative pressure with the pump 83, it will be appreciated that positive pressure may instead be generated.  
20

While the embodiments described herein use a diaphragm 13, any suitable structure to transmit pressure while isolating either side of the system may be used.

Figure 10 shows a schematic of a basic pneumatic system 200 for a breast pump  
25 100. In the system 200 milk expressed into the breast shield 7 is directed through the breast shield spout 9 through the torturous air-liquid labyrinth interface 95. The milk is directed through the non-return valve 37 to the collection container 3. This side of the system forms the “dirty” side 201.

30 The rest of the pneumatic system 200 forms the “clean” side 202 and is separated from contact with milk. This is achieved by way of a flexible diaphragm 13 which forms a seal between the two sides of the system. The diaphragm 13 has a milk-flow side 13A and an air-flow side 13B.

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The "clean" side 202 of the system 200 is a closed system. This side 202 may contain a pressure sensor 101 in pneumatic connection with the diaphragm 13 and the pump 83. Preferably, the pump 83 is a piezoelectric pump (or piezo pump). Due to their low noise, strength and compact size, piezoelectric pumps are ideally suited to the embodiment of a small, wearable breast pump. The pump 83 has an output 83A for generating pressure, and an exhaust to the atmosphere 83B. In a first phase of the expression cycle, the pump 83 gradually applies negative pressure to clean half of the closed system 202 behind the diaphragm 13. This causes the diaphragm 13 to extend away from the breast, and thus the diaphragm 13 conveys a decrease in pressure into the breast shield 7. The reduced pressure encourages milk expression from the breast, which is directed through the tortuous labyrinth system 95 and the one-way valve 37 to the collection bottle 3.

While in the depicted embodiment the exhaust 83B is not used, it may be used for functions including, but not limited to, cooling of electrical components, inflation of the bottle to determine milk volume (discussed further later) or inflation of a massage bladder against the breast. This massage bladder may be used to help mechanically encourage milk expression.

The "clean" side 202 further comprises a two-way solenoid valve 103 connected to a filtered air inlet 105 and the pump 83. Alternatively, the filter could be fitted on the pump line 83A. If the filter is fitted here, all intake air is filtered but the performance of the pump may drop. After the negative pressure has been applied to the user's breast, air is bled into the system 202 through the valve 103 in a second phase of the expression cycle. In this embodiment, the air filter 105 is affixed to this inlet to protect the delicate components from degradation. In particular, in embodiments with piezoelectric components these are particularly sensitive.

The second phase of the expression cycle and associated switching of valve 103 is actioned once a predefined pressure threshold has been reached. The pressure is detected by a pressure sensor 101.

In certain embodiments, if the elasticity and extension of the diaphragm 13 may be approximated mathematically at different pressures, the pressure measured by sensor 101 can be used to infer the pressures exposed to the nipple on the opposite side of the diaphragm 13.

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Figure 11 shows an alternative pneumatic system 300. The core architecture of this system is the same as the system shown in Figure 10.

5 In this system 300, the closed loop 202 is restricted with an additional three way solenoidal valve 111. This valve 111 allows the diaphragm 13 to be selectively isolated from the rest of the closed loop 202. This additional three way valve 111 is located between the diaphragm 13 and the pump 83. The pressure sensor 101 is on the pump 83 side of the three way valve 111. The three way valve 111 is a single pole double throw (SPDT) valve,  
10 with the diaphragm 13 connected to one of the throws 111B. The pump 83 is connected to the pole 111A. The final throw 111C is connected to a dead-end 113. This dead-end 113 may either be a simple closed pipe, or any component(s) that does not allow the flow of air into the system 202. This could include, for example, an arrangement of one-way valves.

15 In this system 300, therefore, the pump 83 has the option of applying negative pressure directly to the pressure sensor 101. This allows repeated testing of the pump in order to calibrate pump systems, or to diagnose issues with the pump in what is called a dead end stop test. This is achieved by throwing the valve to connect the pump 83 to the dead end 113. The pump 83 then pulls directly against the dead end 113 and the reduction  
20 of pressure within the system can be detected by the pressure sensor 101.

Using this function, material fatigue of the pump 83 can be assessed directly. Principally, this knowledge can be used to ensure user experience is not altered, despite the changing output of the pump 83 as it degrades over time. For example, the pump cycle  
25 may be changed to drive longer or operate under increased voltage to ensure the same pressures are met. This is particularly relevant for piezo pumps where the output may vary significantly.

Figure 12 shows a schematic for a system 400 for a breast pump 100 which can  
30 estimate the volume of milk collected in the collection container 3 from data collected on the "clean" airflow part 202 of the system 400.

The pump 83 is connected to the circuit via two bleed valves 126, 128. The first bleed valve 126 is arranged to function when the pump 83 applies a negative pressure. As



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such, this valve 126 is connected to a “bleed in” 127, for supplying atmospheric air to the system 202.

5 The second bleed valve 128 is arranged to function when the pump 83 applies a positive pressure. As such, this valve 128 is connected to a “bleed out” 129 for bleeding air in the system 202 to the atmosphere.

10 During a milking pump cycle, the pump 83 applies negative pressure on the “clean” side 13B of the diaphragm 13 which causes its extension towards the pump 83. This increases the volume of the space on the “dirty” side 13B of the diaphragm 13. This conveys the decrease in pressure to the breast to encourage expression of milk. A set of three non-return valves 121, 123, 125 ensure that this decrease in pressure is applied only to the breast (via the breast shield 7) and not the milk collection container 3.

15 To measure the volume of milk collected in the container 3, the pump 83 is used instead to apply positive pressure to the diaphragm 13. The diaphragm 13 is forced to extend away from the pump 83 and conveys the pressure increase to the “dirty side” 201 of the system 400. The three non-return valves 121, 123, 125 ensure that this increase in pressure is exclusively conveyed to the milk collection container 13.

20

The resulting pressure increase is monitored behind the diaphragm 13 from the “clean” side 202 by a pressure sensor 101. Preferably, the pressure sensor 101 is a piezoelectric pressure sensor (piezo pressure sensor). The rate at which the pump 83 (at constant strength) is able to increase the pressure in the system 400 is a function of the volume of air that remains in the milk collection container 3. As air is many times more compressible than liquid, the rate at which pressure increases in the system 400 can be expressed as an approximate function of the volume of milk held in the collection container 3.

30 Thus by increasing the pressure in this fashion, the rate of pressure increase can be determined, from which the volume of milk held in the container 3 is calculable.

35 The inventor has proved this method for estimating milk volume. Figure 13 shows repeated milking and volume measurement cycles as the collection container 3 is filled. To determine the rate of pressure increase the pump 83 was run for a fixed time. As pumping

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proceeds and the volume of air reduces in the system 400, the pump 83 is able to achieve a higher pressure. Each milking cycle is represented by a positive pressure spike 41. There is a clear upwards trend 43 in magnitude of positive pressures achieved as the collection container 3 is filled.

5

In this manner, an estimate can be obtained for the volume of milk in the container 3 based upon the measured pressures.

Figure 13 also shows a dead end stop pump test 45 as described above. The  
10 negative spike 45 shows the application of negative pressure directly to the pressure sensor 101.

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## CLAIMS:

1. A breast pump for wearing inside a bra, the breast pump comprising:  
 a breast shield for engagement with the user's breast;  
 a housing for receiving at least a portion of the breast shield;  
 5 a pump inside the housing for generating a negative pressure in the breast shield;  
 a battery inside the housing for powering the pump;  
 a detachable rigid milk collection container attachable, in use, to a lower face of the  
 housing and connected to the breast shield for collecting milk expressed by the user with a  
 milk-flow pathway defined from an opening in the breast shield to the milk collection  
 10 container; and

a barrier, the pump acting on one side of the barrier to generate a pressure on the  
 opposite, milk-flow, side of the barrier, the barrier having an outer periphery,  
 wherein:

the shield, housing, pump, battery and container are provided as a unit with a  
 15 convex outer surface contoured to fit in a bra; and

the milk-flow pathway extends past the outer periphery of the barrier.

2. A breast pump for wearing inside a bra, the breast pump comprising:  
 a breast shield for engagement with the user's breast;  
 20 a housing for receiving at least a portion of the breast shield;  
 a pump inside the housing for generating a negative pressure in the breast shield;  
 a battery inside the housing for powering the pump;  
 a detachable rigid milk collection container attachable, in use, to a lower face of the  
 housing and connected to the breast shield for collecting milk expressed by the user with a  
 25 milk-flow pathway defined from an opening in the breast shield to the milk collection  
 container,  
 wherein:

the shield, housing, pump, battery and container are provided as a unit with a  
 convex outer surface contoured to fit in a bra; and

30 the breast shield comprises a shield flange for engaging the user's breast, and an  
 elongate spout aligned with the opening and extending away from the user's breast, the  
 spout being substantially aligned, in use, with the user's nipple and areolae; the spout  
 comprising a first opening for depositing milk into the collection container and a second  
 opening for transferring pressure generated by the pump to the user's nipple, the shield  
 35 flange and spout being detachable from the housing together.

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3. A breast pump for wearing inside a bra, the breast pump comprising:  
a breast shield for engagement with the user's breast;  
5 a housing for receiving at least a portion of the breast shield;  
a piezo pump inside the housing for generating a negative pressure in the breast shield;

a battery inside the housing for powering the pump;

a detachable milk collection container attachable, in use, to a lower face of the

10 housing and connected to the breast shield for collecting milk expressed by the user with a milk-flow pathway defined from an opening in the breast shield to the milk collection container,

wherein the shield, housing, pump, battery and container are provided as a unit with a convex outer surface contoured to fit in a bra.

15 4. The breast pump according to claim 1 or 3 wherein the breast shield comprises a shield flange for engaging the user's breast, and an elongate spout aligned with the opening extending away from the user's breast, the spout being substantially aligned, in use, with the user's nipple and areolae; the spout comprising a first opening for depositing  
20 milk into the collection container and a second opening for transferring pressure generated by the pump to the user's nipple.

5. The breast pump of claim 4, wherein the shield flange and spout are detachable from the housing together

25 6. The breast pump of claim 2, 4 or 5, wherein the spout is integral with the breast shield.

7. The breast pump according to claim 2 or 4 to 6, wherein the breast shield cup  
30 extends over a majority of the inner surface of the unit.

8. The breast pump of claim 7, wherein the breast shield extends over 80% of the inner surface of the unit.

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9. The breast pump of any of claims 2 or 4 to 8, wherein the spout connects directly to the container.

10. The breast pump of any of claims 2 or 4 to 9, wherein the spout comprises an outflow opening for depositing milk directly above the milk collection container.

11. The breast pump of any of claims 2 or 3, and claims 4 to 10 when dependent upon claims 2 or 3, further comprising a barrier, the pump acting on one side of the barrier to generate a pressure on the opposite, milk-flow, side of the barrier.

12. The breast pump of claim 10, wherein the barrier has an outer periphery and the milk-flow pathway extends past the outer periphery of the barrier.

13. The breast pump of any of claims 2, 11 or 12, wherein the milk-flow pathway is beneath the barrier.

14. The breast pump of any of claims 2 or 11 to 13, wherein the milk-flow pathway does not pass through the barrier.

15. The breast pump of any of claims 2 or 11 to 14, wherein the barrier is mounted in a housing on the breast shield.

16. The breast pump of claim 15, wherein the housing is integral with the breast shield.

17. The breast pump of any of claims 2 or 11 to 16, wherein the barrier is not an annulus.

18. The breast pump of any of claims 2 or 11 to 17, wherein the barrier provides a seal to isolate the pump from the milk-flow side of the barrier.

19. The breast pump of claim 18, wherein the only seal is around an outer edge of the barrier.

20. The breast pump of any of claims 2 or 11 to 19, wherein the barrier is a diaphragm.

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21. The breast pump of claim 20, wherein the diaphragm is a continuous membrane which is devoid of any openings or holes.

22. The breast pump according to any preceding claim, further comprising a pressure  
5 sensor in pneumatic connection with the pump.

23. The breast pump of any preceding claim, wherein the width of the breast pump is less than 110 mm.

10 24. The breast pump of any preceding claim, wherein the height of the breast pump is less than 180 mm.

25. The breast pump of any preceding claim, wherein the plane to plane depth of the breast pump is less than 100 mm.

15

26. The breast pump of any preceding claim, wherein, in use, the breast pump extends from the user's breasts by 3 to 4 cup sizes as per the European standard EN 13402.

27. The breast pump of any preceding claim, wherein the milk container has a volume  
20 of greater than 120 ml.

28. The breast pump of claim 27, wherein the milk container has a volume of greater than 140 ml.

25 29. The breast pump of claim 27 or 28, wherein the milk container has a volume of less than 150 ml.

30. The breast pump of any preceding claim, wherein the milk container and housing form a substantially continuous outer surface of the breast pump.

30

31. The breast pump of any preceding claim, wherein the milk container is at least partially transparent on the outer surface of the breast pump.

32. The breast pump of any preceding claim, wherein the milk container is provided with  
35 a spout.

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33. The breast pump of any preceding claim, wherein the milk container is provided with attachment means for attaching a teat to the container.

5 34. The breast pump of any preceding claim, wherein the breast shield is removable.

35. The breast pump of any preceding claim, wherein the milk collection container is formed of at least two rigid sections which are connectable.

10 36. The breast pump of any preceding claim, further comprising a one-way valve between an inner surface of the breast shield, for engaging with the breast in use, and the milk container.

15 37. The breast pump of claim 36, wherein the one-way valve is located in an opening to the container.

38. The breast pump of claim 1 or 2, wherein the pump is a piezo pump.

20 39. The breast pump of any of any preceding claim, wherein the breast shield is detachable from the breast pump.

40. The breast pump of any of claims 22 or 23 to 39 when dependent upon claim 22, further comprising a single pole, double throw pneumatic valve, wherein:  
the pole is in pneumatic connection with the pump and pressure sensor;  
25 one of the throws is in pneumatic connection with the diaphragm; and  
the other throw is in pneumatic connection with a dead-end.

41. The breast pump of any of claim 22 or 23 to 40 when dependent upon claim 22, further comprising:  
30 a first non-return valve between the milk-flow side of the diaphragm and the breast shield, configured to allow only a negative pressure to be applied to the breast shield by the pump;  
a second non-return valve between the milk-flow side of the diaphragm and the milk collection container configured to allow only a positive pressure to be applied to the milk  
35 collection container by the pump; and

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a pressure sensor in pneumatic connection with the pressure-generation side of the diaphragm.

42. A method of estimating the pressure applied by a breast pump according to claim  
5 40, comprising the steps of:

providing a breast pump according to claim 40;  
selecting a pressure cycle from a pre-defined list of pressure cycles;  
applying pressure with the pump to stimulate milk expression;  
reading the output of the pressure sensor;

10 adjusting the applied pressure of the pump to match the pressure profile selected  
by the user.

43. The method of claim 42, further comprising:

15 approximating the elasticity and extension of the diaphragm at the relevant  
pressure; and

calculating an estimated applied pressure based upon the output of the pressure  
sensor and the approximated elasticity and extension of the diaphragm.

44. A method of estimating the milk collected by a breast pump according to claim 41,  
20 comprising the steps of:

providing a breast pump according to claim 41;  
generating a positive pressure with the pump;  
transmitting the positive pressure via the diaphragm and second non-return valve to  
only the milk collection container;

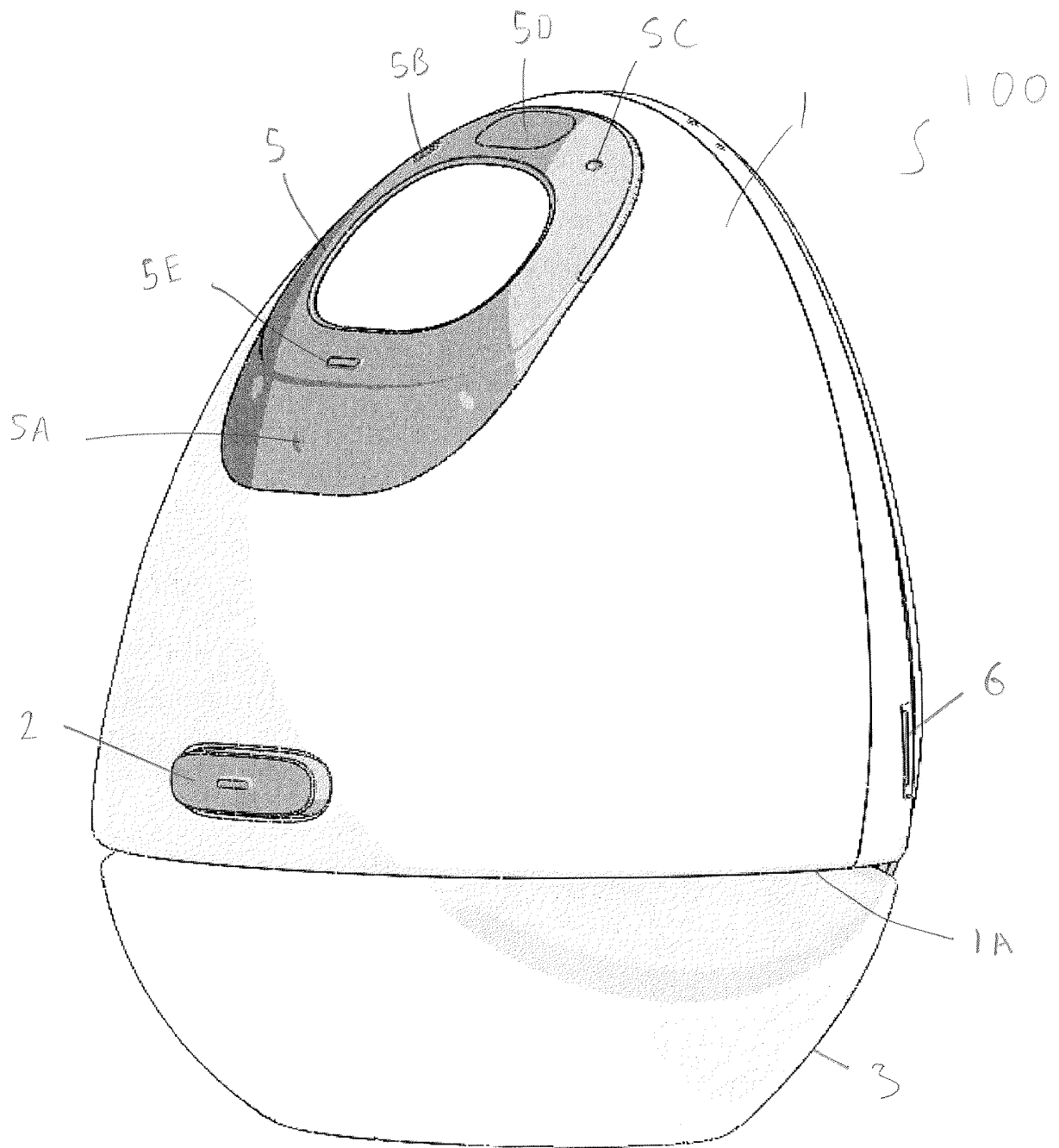
25 measuring the increase in pressure by the pressure sensor in pneumatic connection  
with the diaphragm;

estimating the volume of milk inside the milk collection container based upon the  
rate of increase of pressure.



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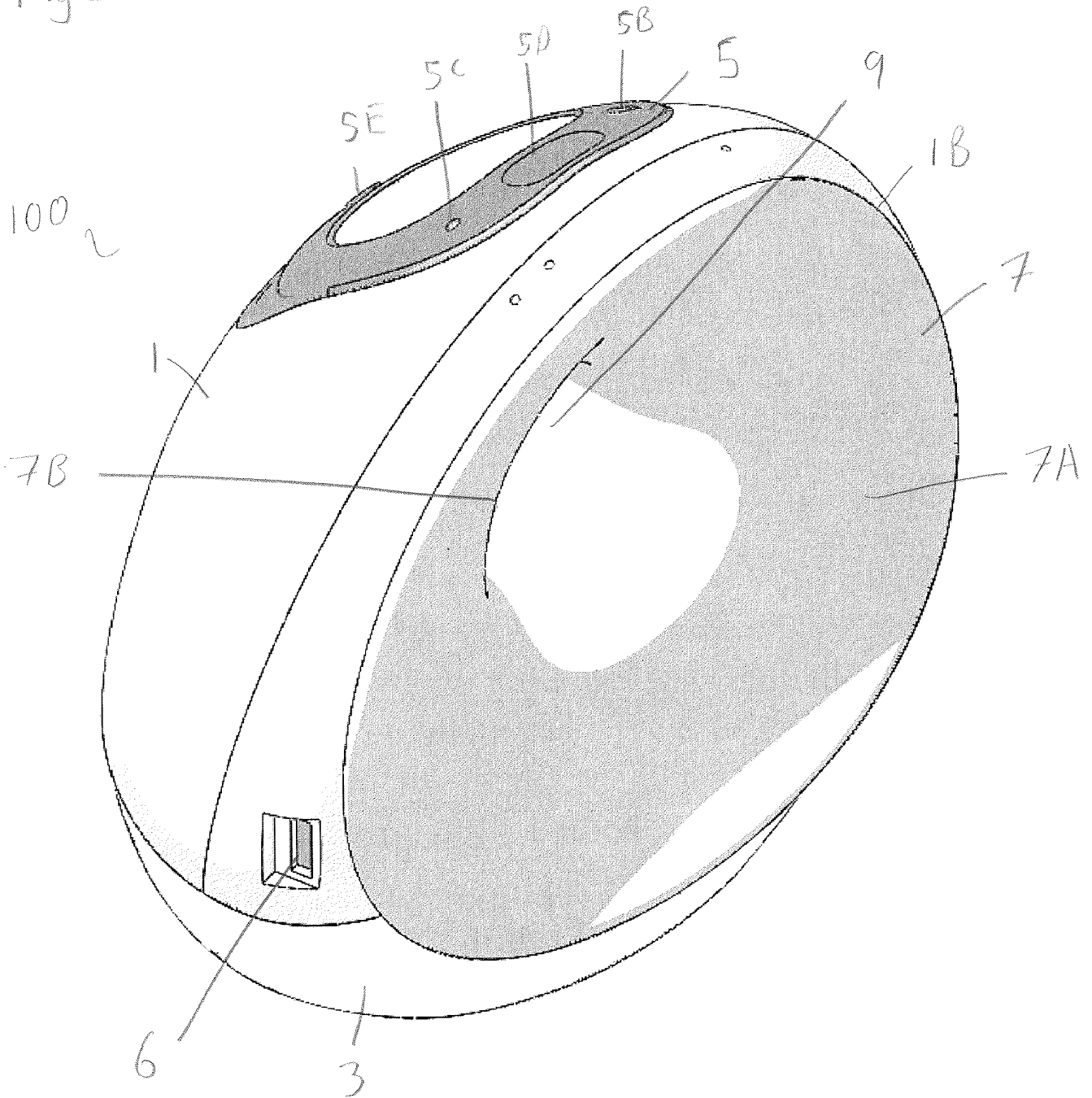


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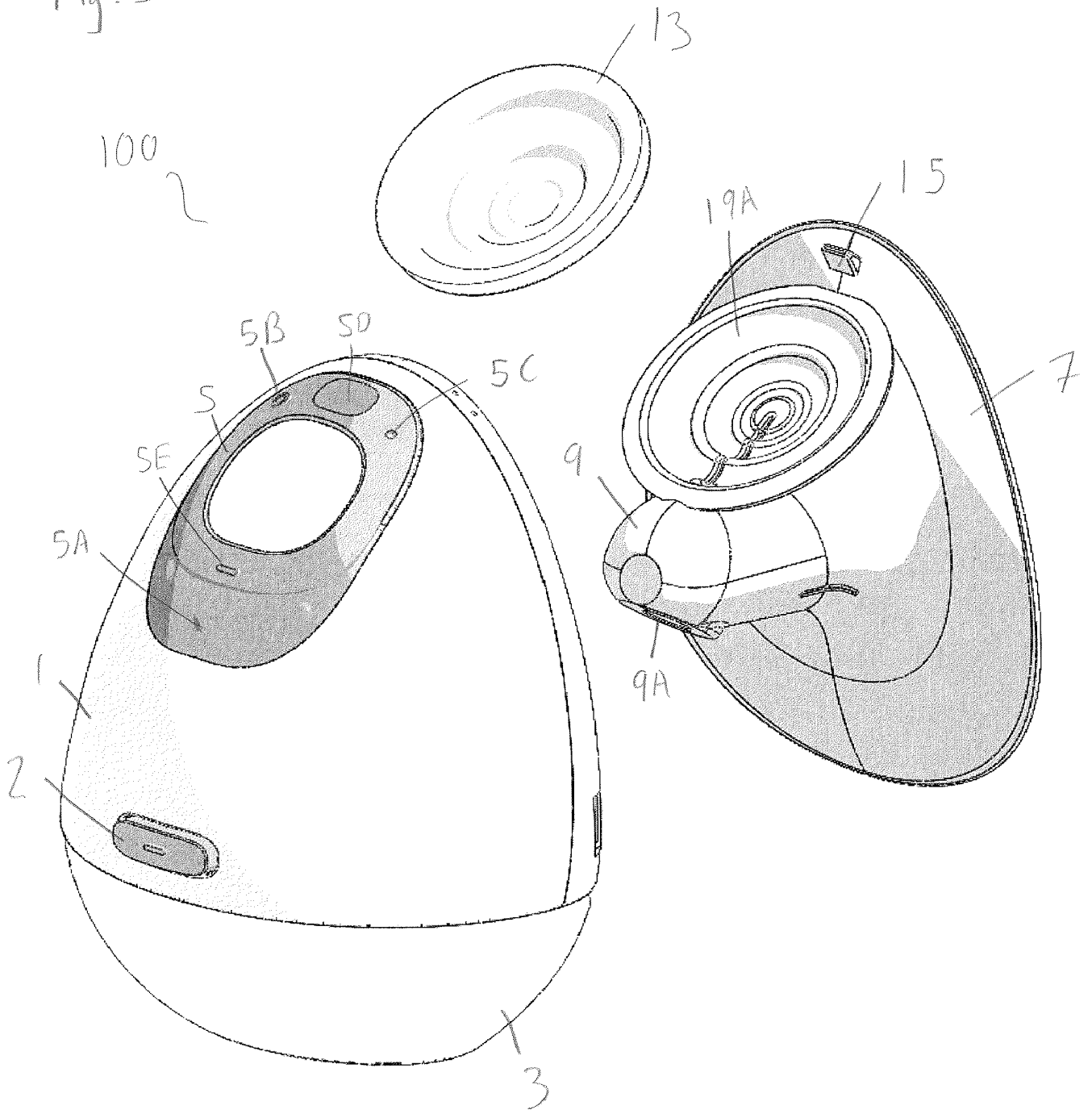
Fig 2



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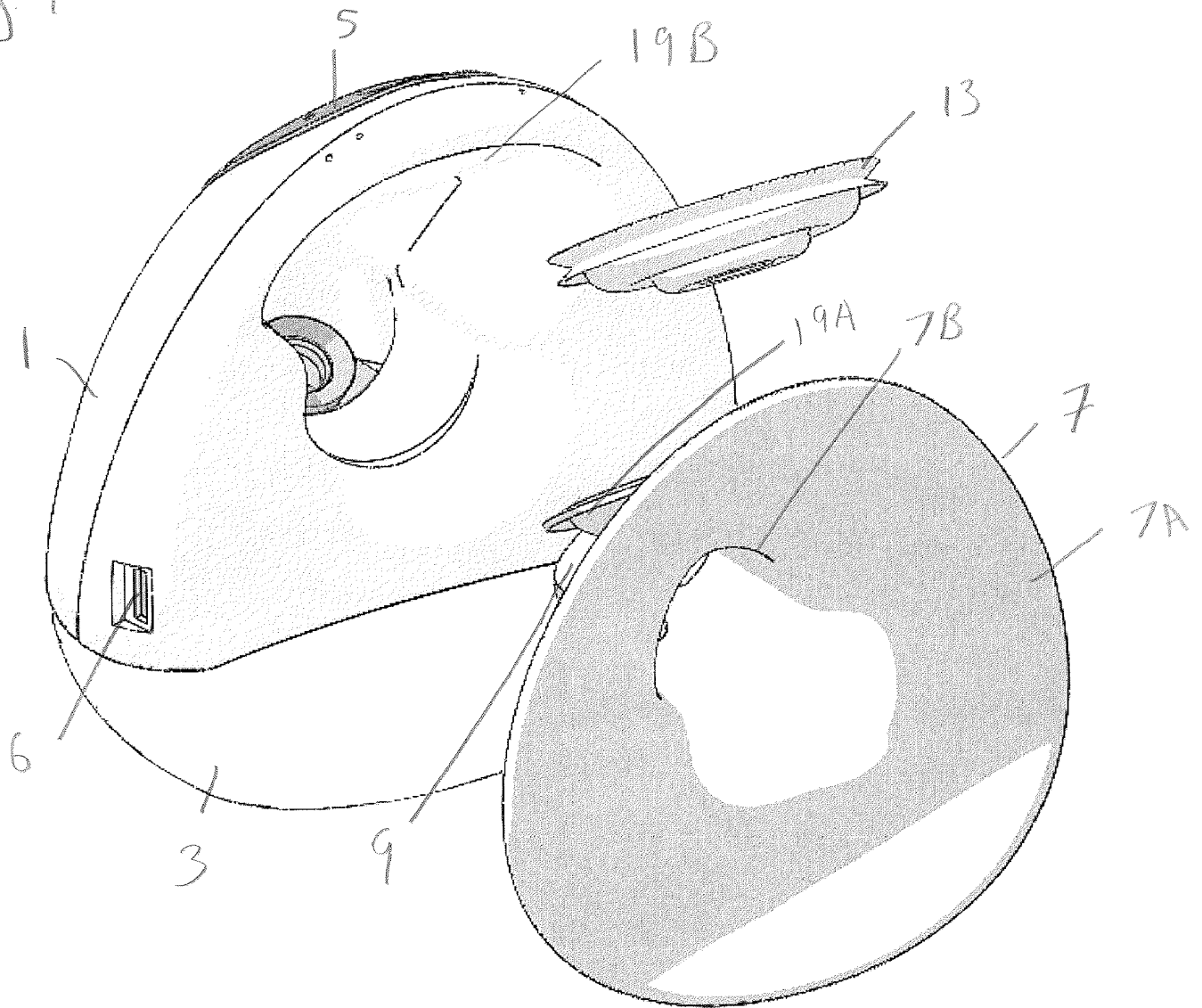
Fig. 3



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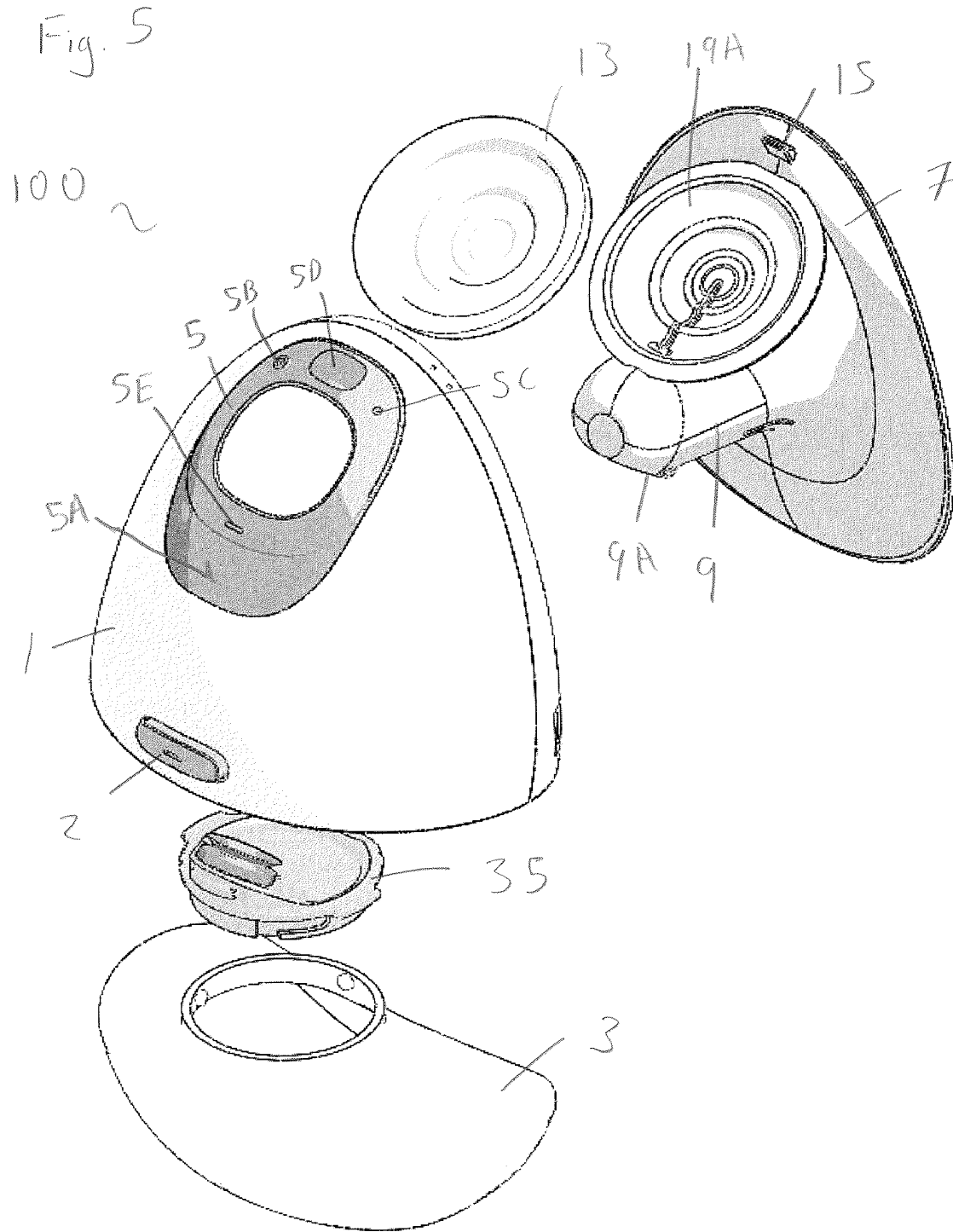
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Fig. 4



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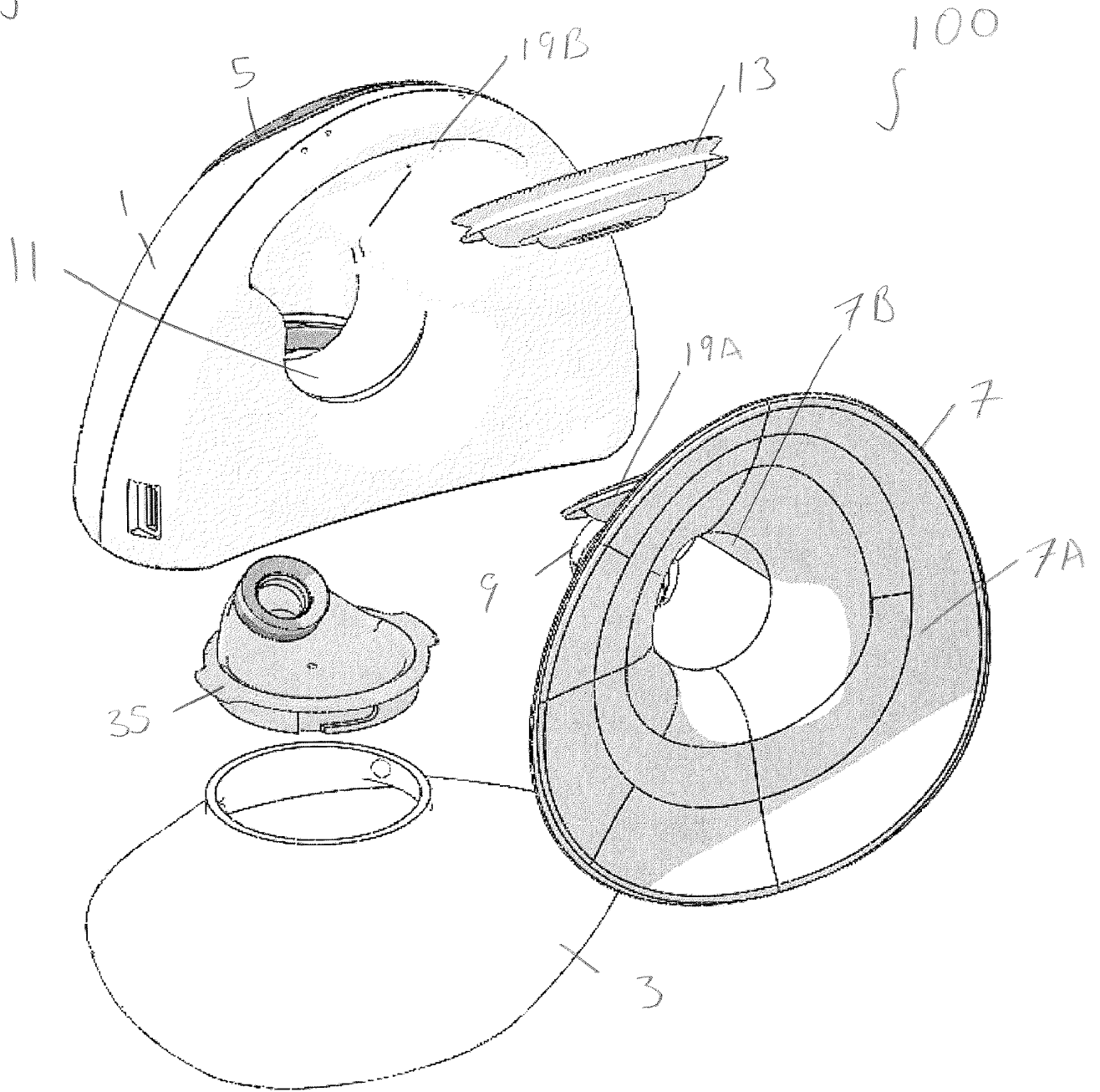
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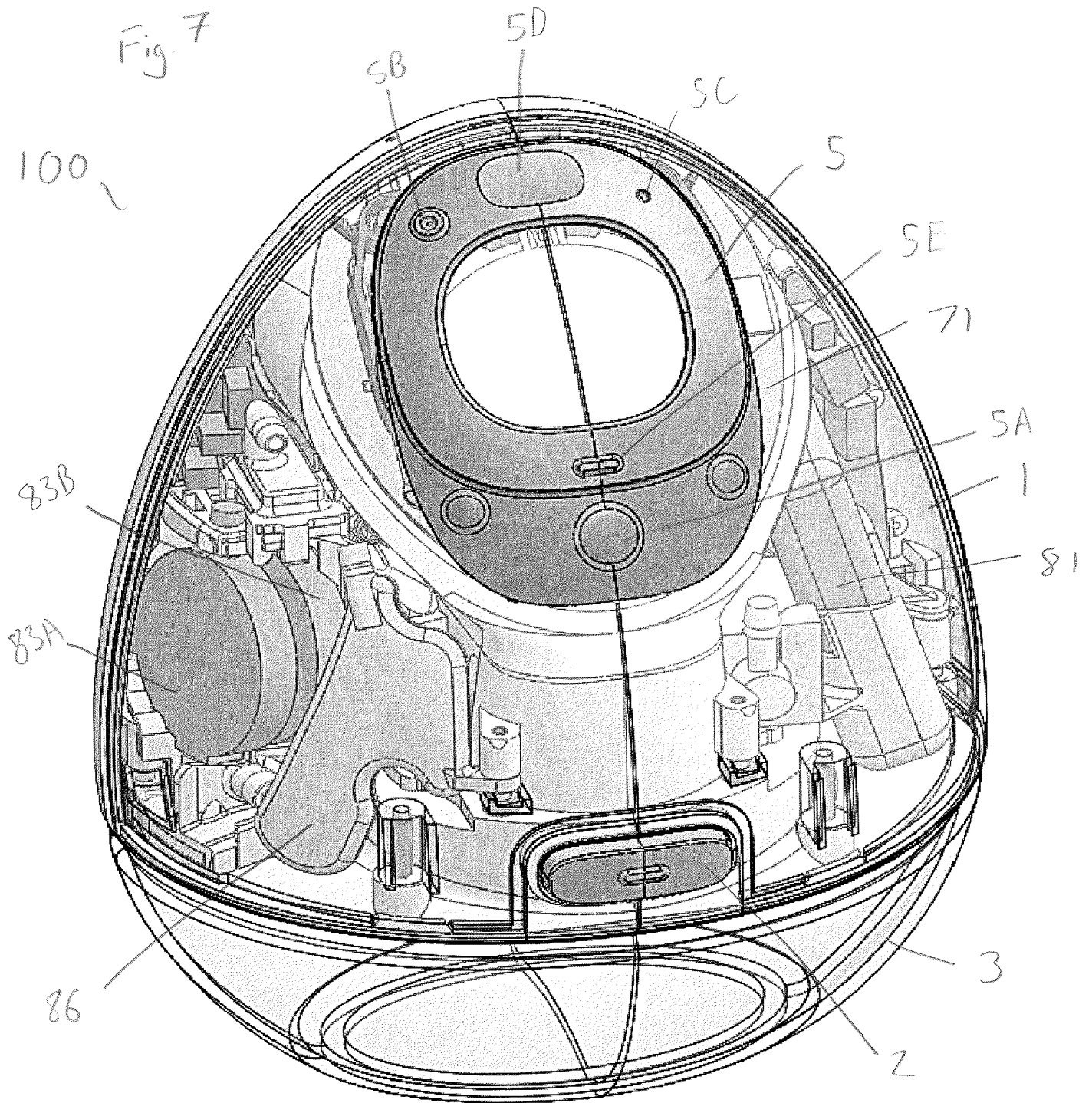
Fig. 6



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Fig. 7



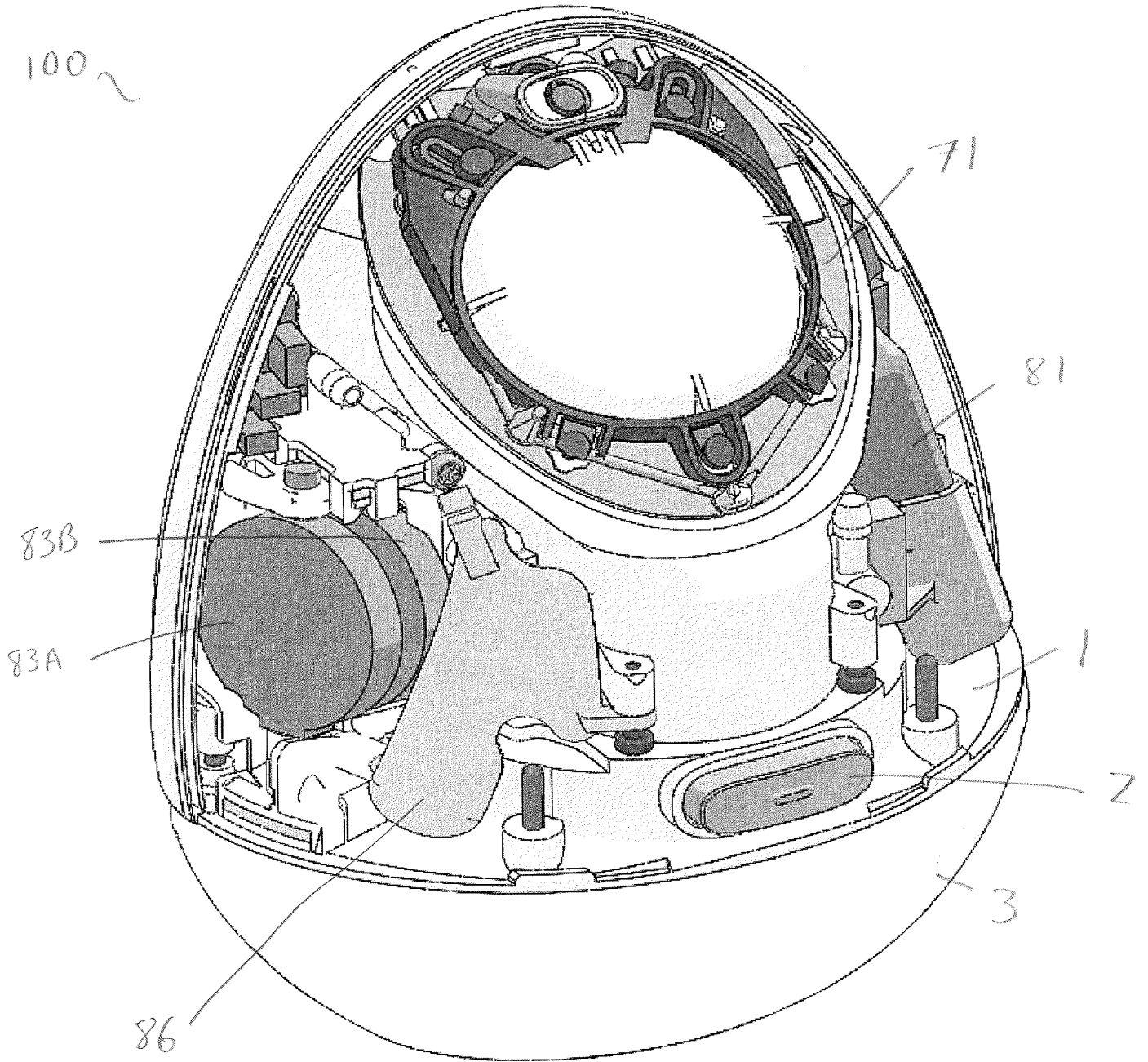
7397102; JCP2; JCP2



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Fig. 8

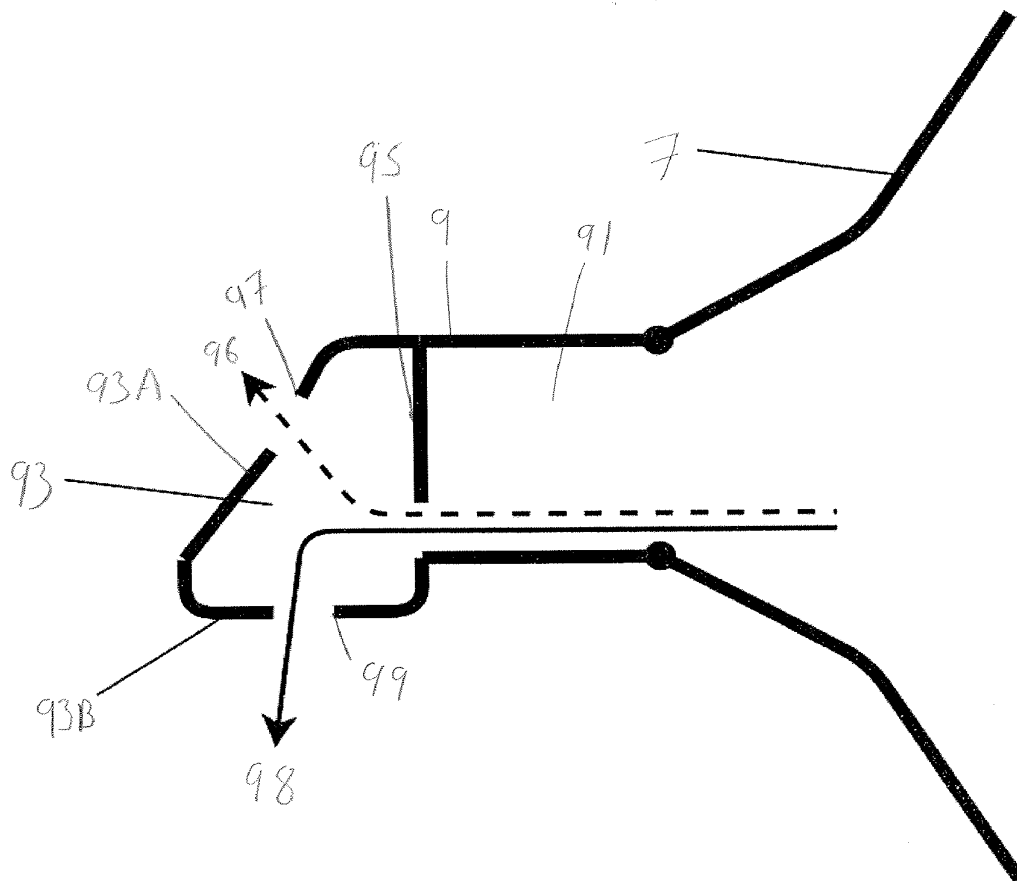




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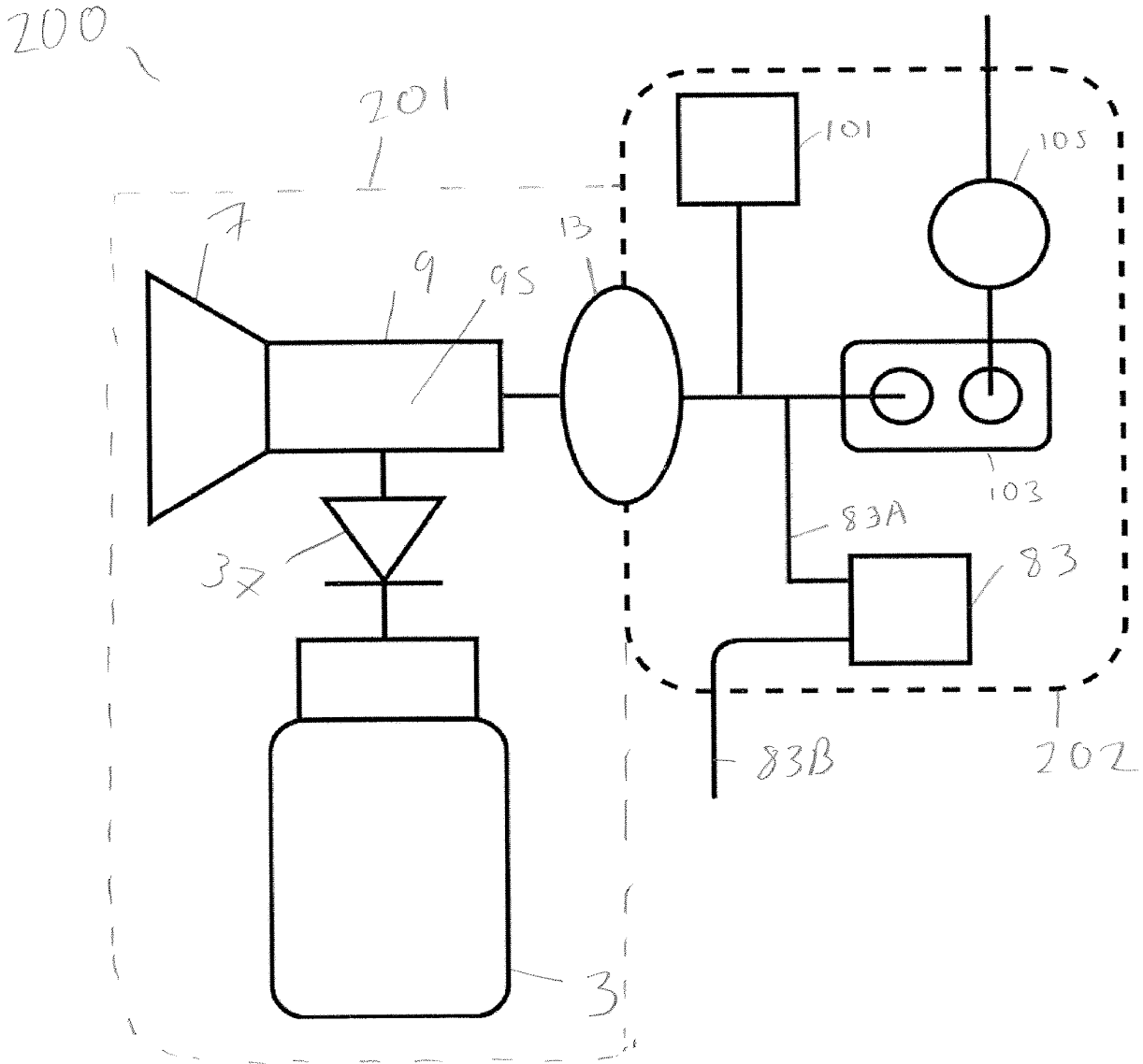
Fig. 9



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Fig. 10

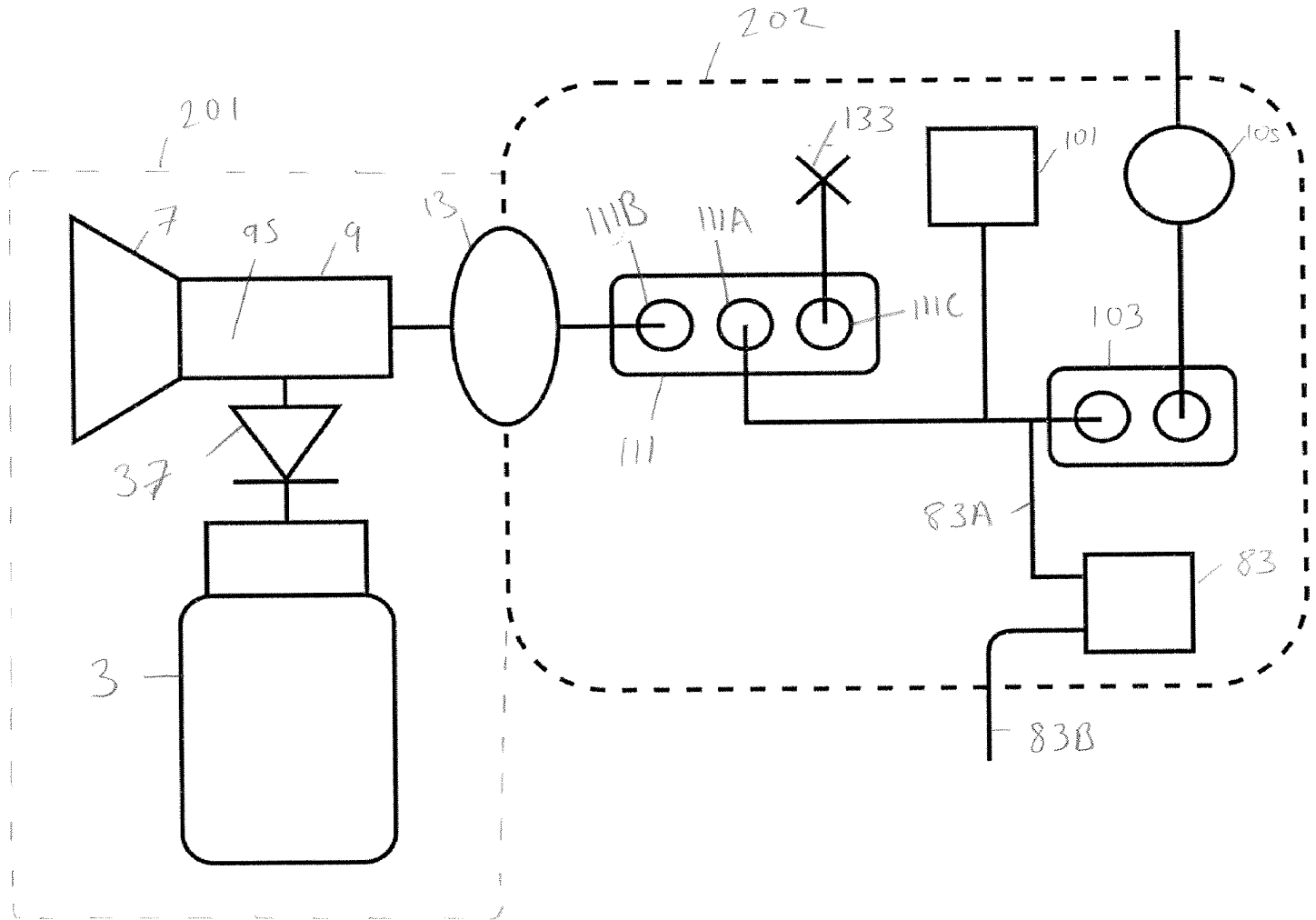


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Fig 11

300  
}

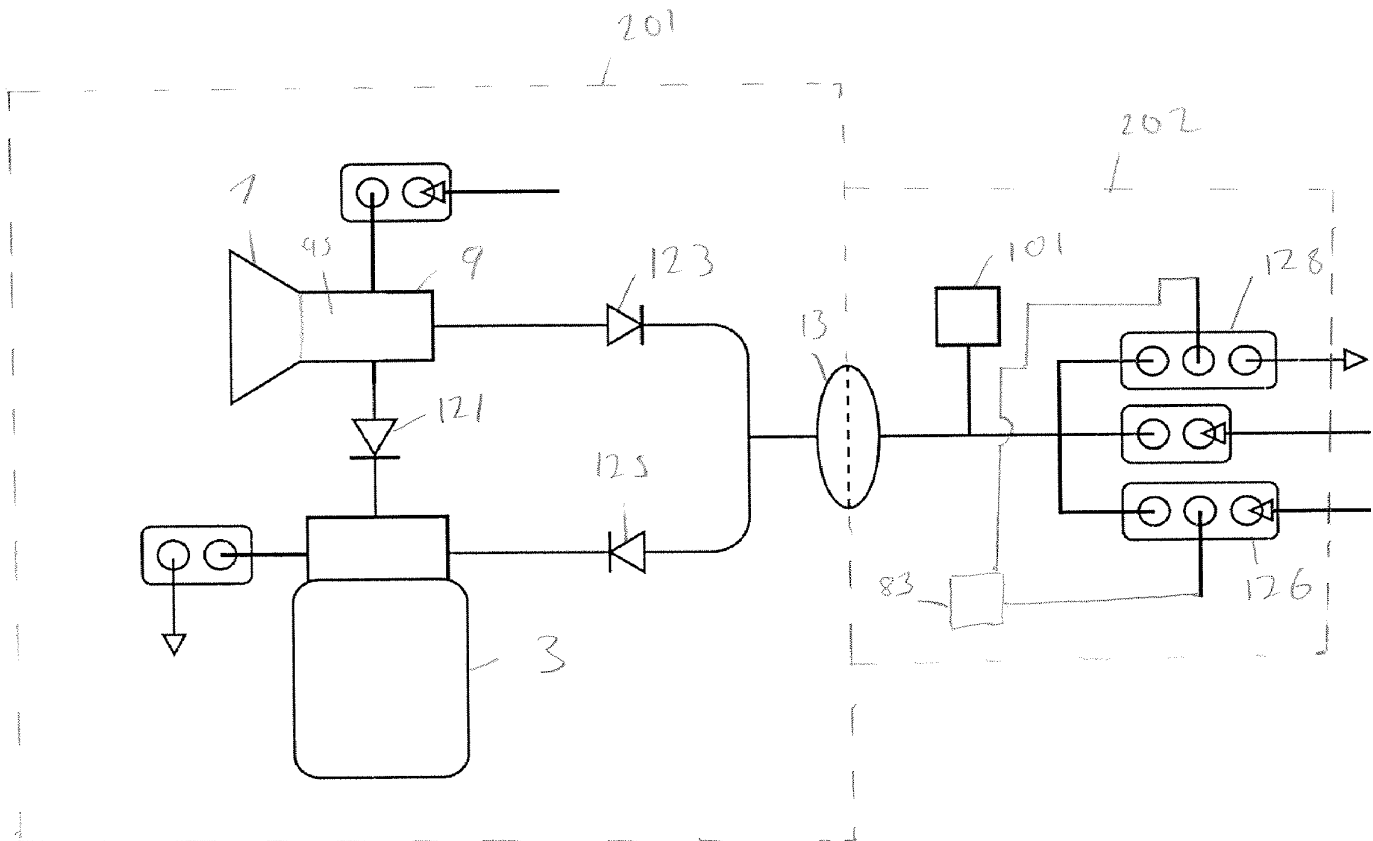


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Fig. 12

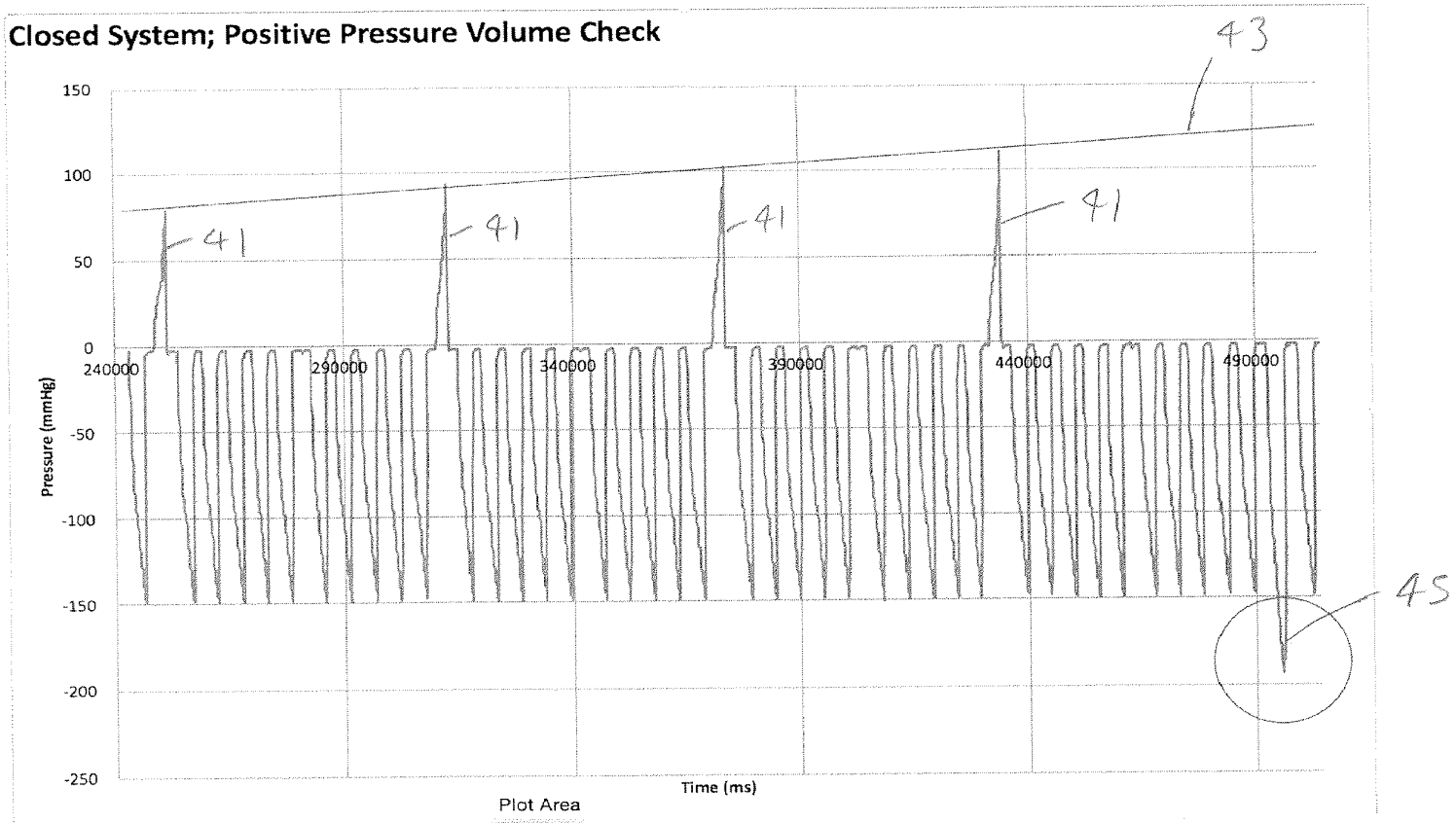
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Fig 13



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NP10 8QQ

**Application number** GB1809036.5

1. Your reference	<b>Elvie Pump (UK)</b>		
2. Full name, address and postcode of the applicant or of each applicant	<b>CHIARO TECHNOLOGY LIMITED</b> <b>63 - 66 Hatton Garden</b> <b>London EC1N 8LE</b> <b>United Kingdom</b>		
Patents ADP number (if you know it)			<b>11287869002</b>
3. Title of the invention	<b>Breast pump system</b>		
4. Name of your agent (if you have one)	<b>Langley, Mr Peter</b> <b>Origin Limited</b> <b>Twisden Works</b> <b>Twisden Road</b> <b>London NW5 1DN</b> <b>United Kingdom</b>		
"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)	<b>11436136001</b> <del><b>09541046004</b></del>		
Patents ADP number (if you know it)			
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
	Country	Application number	Date of filing
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		Number of earlier UK application	Date of filing (day / month / year)
7. Inventorship: (Inventors must be individuals not companies)			
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Continuation sheets of this form

Description: **121**

Claim(s): **n/a**

Abstract: **n/a**

Drawing(s): **44**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	PDAS Access Code
10. If you are also filing any of the following, state how many against each item.			

Priority documents: **0**

Statement of inventorship and right to grant of a patent  
(Patents Form 7): **0**

Request for search (Patents Form 9A): **0**

Request for substantive examination (Patents Form 10): **0**

Any other documents (please specify): **PDAS Registration Form**

11. I/We request the grant of a patent on the basis of this application.

Date: **01 Jun 2018**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant	<b>Langley, Mr Peter</b> <b>Email: roland@origin.co.uk</b> <b>Telephone: 02074241952</b> <b>Fax: 02072090643</b>
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## BREAST PUMP SYSTEM

### BACKGROUND OF THE INVENTION

5

#### 1. Field of the Invention

The field of the invention relates to a breast pump system; one implementation of the system is a wearable, electrically powered breast pump system for extracting milk from a mother.

10

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#### 2. Description of the Prior Art

The specification of the present disclosure is broad and deep. We will now describe the prior art in relation to key aspects of the present disclosure.

20

##### Prior art related to breast pump systems

A breast pump system is a mechanical or electro-mechanical device that extracts milk from the breasts of a lactating woman.

A typical breast pump design is as shown in WO 96/25187 A1. A large suction generating device is provided, which is freestanding. This is attached by air lines to one or two breast shields which engage with the user's breasts. A pressure cycle is applied from the suction generating device, via the air lines, to the breast shields. This generates a pressure cycle on the user's breasts to simulate the suction generated by a feeding child.

25  
30

The suction generating device is a large component that connects to mains power to operate the pumps therein. Milk collection bottles are provided to store the expressed

breast milk. In the system of WO 96/36298 A1 separate bottles are provided attached to each breast shield. A single bottle with tubing connecting to each breast shield may also be used. But for a mother to use this discretely, such as in an office environment, specialised bras must be used. In particular, breast-pumping bras which have a central slit, for the nipple tunnel of the breast shield to extend through, are typically used. The breast shield is held within the bra, with the suction generating device and milk bottle outside the bra.

The fundamental breast pump system has not significantly evolved from this approach, only minor technical improvements have been made.

However, these systems present a number of significant disadvantages. As the suction generating device is a large freestanding unit connected to mains power, the user may feel tethered to the wall. The known devices typically also require a specific user posture and undressing to function normally. This is obviously difficult for a user to do discretely, such as in an office setting. The known devices are also typically noisy, uncomfortable, and hard to clean.

Fully integrated wearable breast pump systems have begun to enter the market, such as described in US 2016 0206794 A1. In such pump systems, the suction source, power supply and milk container are contained in a single, wearable device; there is no need for bulky external components or connections. Such devices can be provided with a substantially breast shaped convex profile so as to fit within a user's bra for discrete pumping, as well as pumping on-the-go without any tethers to electrical sockets or collection stations. The internal breast shield is naturally convex to fit over a breast.

In US 2016 0206794 A1, when viewed from the front, the breast pump device has a 'tear-drop' rounded shape, fuller at its base than at its top. But it uses collapsible bags as milk collection devices. As the collection bag systems are collapsible, it can be difficult for a user to extract all of their milk from the bag, due to the small cut opening that is needed and the capillary action between the bonded plastic sheets that form the bag. This waste can be disheartening for the user, as this is food for their child. The bags are also not re-usable, so the user is required to purchase and maintain a stock of these. As well as presenting a recurring cost, if the user runs out of stock they are unable to use the

product until more bags are purchased.

Furthermore, as a result of the collapsible bags, a complex and somewhat noisy pumping arrangement is necessary. In particular, the breast shield connects to a tube which is provided with compression units which “step” the expressed milk through the tube to the collection bag. This uses the breast milk as a hydraulic fluid to generate suction on the breast. In order to carry this out, a complex sequenced pulsing arrangement must be implemented.

In addition to these systems being particularly complex and wasteful, only a relatively small bag can be used. In US 2016 206794, approximately 110 ml (4 fluid ounces) of milk can be collected before the bag must be changed. While this may be sufficient for some users, others may produce much more milk in a session.

A further integrated wearable breast pump system is shown in US 2013 0023821 A1. In the third embodiment in this document, the breast pump system includes a motor driven vacuum pump and power source. An annular (or punctured disc) membrane is provided, with the flow path of the milk going through the centre of the annulus. The membrane is housed in separate housing and is sealed at its inner and outer edges. The breast shield has a small protrusion to engage with these housing components. However, the design of this breast pump system results in a number of problems. The use of an annular membrane, with the fluid flow path running through the opening of the annulus is undesirable as it results in a large and bulky device. There is therefore a need for improved integrated breast pump systems.

#### **Prior Art related to liquid measurement systems**

In the context of breast pump systems, it is useful to measure the quantity of expressed milk. One way to do this is to have a clear container for the breast pump, through which the level of expressed milk inside the container can be seen. However, viewing the milk bottle is not always possible, for example in a breast pump that collects milk while being worn inside a maternity bra.

An existing apparatus for detecting the level of liquid inside a container of a breast pump is that disclosed in US 2016/296681. In this apparatus, a sensing mechanism is provided

at the top of a container, which detects droplets of liquid, specifically breast milk, entering the container. By detecting these droplets entering the container, the apparatus can determine the quantity of liquid which enters the container. In this apparatus, an accurate indication of the level of liquid in the container is reliant on the sensing  
5 mechanism being able to accurately record every droplet entering the container.

Particularly at times when liquid enters the container at a high flow rate, this accuracy cannot be guaranteed, leading to significant cumulative errors. An accurate indication of the level of liquid in the container in this apparatus is also reliant on the sensing  
10 mechanism always being on during the pumping process, so that power consumption of the sensing mechanism is correspondingly high.

In view of the above, there is the need for an improved way to determine the level of liquid inside a container connected to a breast pump.

15

#### **Prior Art related to bra clips**

Many specialised bras (or brassieres) exist for maternity use and that facilitate nursing and/or breast pumping for milk collection, without the need to remove the bra itself. In a traditional nursing bra, this is achieved with the use of an at least partially detachable  
20 cup, which can be unhooked for feeding and/or pumping.

Further specialised bras are known which are provided with cut-out portions or slits which substantially align with the wearer's areola and nipple. Traditional breast pump systems comprise an elongate breast shield which extends away from the breast towards  
25 an external bottle and source of suction. The breast shield is arranged to extend through the cut-out portion or slit, with the collection bottle and pumping apparatus placed outside of the bra. These systems require the user to remove or unbutton any overgarments, and are uncomfortable when not pumping.

30 Integrated, wearable breast pump systems have begun to enter the market, such as previously noted US 2016 0206794 A1. In such pumps, the suction source, power supply and milk container are all in a single, wearable device, as noted above, without the need for bulky external components or connections. Such devices can be provided with a substantially breast shaped profile so as to fit within a user's bra for discrete pumping, as

well as pumping on-the-go without any tethers to electrical sockets or collection stations.

Maternity (or nursing) bras such as disclosed in US 4,390,024 A have partially detachable cups, with several hooks provided along the bra strap for attaching the cups to the strap.

5 The cups can then be attached to different hooks in order to adjust the bra strap length. However, these attachment points are fixed. Additionally, this bra has been designed to accommodate the change in breast size before and after the feeding/pumping process. It is not designed to accommodate a breast pump. Accordingly, there is a need for a better system to accommodate integrated wearable breast pumps.

10

15

## **SUMMARY OF THE INVENTION**

The invention is a wearable breast pump system including: a housing shaped at least in part to fit inside a bra and including a pumping mechanism; a breast shield; a rigid or  
5 non-collapsible milk container; and in which the breast pump system includes only two parts that are directly removable from the housing in normal use or normal dis-assembly: the breast shield and the rigid, non-collapsible milk container.

**BRIEF DESCRIPTION OF THE FIGURES**

Aspects of the invention will now be described, by way of example(s), with reference to the following Figures, which each show features of various implementations of the invention including optional features that may be utilised:

- Figure 1** is a front view of an assembled breast pump system.
- Figure 2** is a rear view of the assembled breast pump system of Figure 1.
- Figure 3** is a front view of a partially disassembled breast pump system.
- 10 **Figure 4** is a rear view of the partially disassembled breast pump system of Figure 3.
- Figure 5** is a front view of a further partially disassembled breast pump system.
- Figure 6** is a rear view of the further partially disassembled breast pump system of Figure 5.
- 15 **Figure 7** is a front view of the breast pump system of Figure 1, with the outer shell translucent for ease of explanation.
- Figure 8** is a further front view of the breast pump system of Figure 1, with the front of the outer shell removed for ease of explanation.
- Figure 9** is a schematic view of a nipple tunnel for a breast shield.
- Figure 10** is a schematic of a pneumatic system for a breast pump system.
- 20 **Figure 11** is a schematic of an alternative pneumatic system for a breast pump system.
- Figure 12** is a schematic of a further alternative pneumatic system for a breast pump system.
- Figure 13** is a graph depicting measured pressure in the breast pump system of Figure 12 over time.
- 25 **Figure 14** shows schematics for breast shield sizing and nipple alignment.
- Figure 15** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 16** shows a screenshot of an application running on a device connected to the breast pump system.
- 30 **Figure 17** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 18** shows a screenshot of an application running on a device connected to the breast pump system.
- Figure 19** shows a screenshot of an application running on a device connected to the



breast pump system.

**Figure 20** shows a screenshot of an application running on a connected device.

**Figure 21** shows a screenshot of an application running on a connected device.

**Figure 22** shows a screenshot of an application running on a connected device.

5 **Figure 23** shows a screenshot of an application running on a connected device.

**Figure 24** shows a screenshot of an application running on a connected device.

**Figure 25** shows a screenshot of an application running on a connected device.

**Figure 26** shows a diagram of a breast pump sensor network,

10 **Figure 27** shows a sectional view of a device being used to determine the level of liquid in a container;

**Figure 28** shows a sectional view of the device and the container from Figure 27 being used at a different orientation.

**Figure 29** shows a sectional view of the device and the container from Figure 27 being used whilst undergoing acceleration.

15 **Figure 30** shows a sectional view of the device from Figure 27 being used as part of a breast pump assembly.

**Figure 31** shows a sectional view of a device connected between a container and its lid, and which is operable to determine the level of liquid inside the container.

**Figure 32** depicts a prior art design for a maternity bra;

20 **Figure 33** depicts a clip and clasp being fitted to a maternity bra.

**Figure 34** depicts an alternative clip for adjustment of a maternity bra.

**Figure 35** depicts the alternative clip of Figure 34.

**Figure 36** depicts an alternative clip for adjustment of a maternity bra.

**Figure 37** depicts an alternative clip for adjustment of a maternity bra.

25 **Figure 38** depicts an alternative clip for adjustment of a maternity bra.

**Figure 39** depicts adjustment of the maternity bra of Figure 37.

**Figure 40** shows a configuration with two piezo pumps mounted in series.

**Figure 41** shows a configuration of two piezo pumps mounted in parallel.

30 **Figure 42** shows a plot of the air pressure generated as a function of time by two piezo pumps mounted in series and mounted in parallel respectively.

**Figure 43** shows a plot of the air pressure generated as a function of time by two piezo pumps mounted in a dual configuration.

**Figure 44** shows a figure of a pump including two piezo pumps in which each piezo pump is connected to a heat sink.

35

## **DETAILED DESCRIPTION**

We will now describe an implementation of the invention, called the Elvie<sup>TM</sup> pump, in the following sections:

5

**Section A: The Elvie<sup>TM</sup> Breast Pump System**

**Section B: An IR System**

**Section C: A Bra Clip**

**Section D: Piezo Pumps and Wearable Devices**

10

## Section A: The Elvie™ Breast Pump System

### 1. Elvie™ Breast Pump System Overview

5 An implementation of the invention, called the Elvie™ pump, is a breast pump system that is, at least in part, wearable inside a bra. The breast pump system comprises a breast shield for engagement with the user's breast, a housing for receiving at least a portion of the breast shield and a detachable rigid milk collection container attachable, in use, to a lower face of the housing and connected to the breast shield for collecting milk  
10 expressed by the user, with a milk-flow pathway defined from an opening in the breast shield to the milk collection container. The housing inside also includes a pump for generating a negative pressure in the breast shield, as well as battery and control electronics. Unlike other wearable breast pumps, the only parts of the system that come into contact with milk in normal use are the breast shield and the milk container; milk  
15 only flows through the breast shield and then directly into the milk container. Milk does not flow through any parts of the housing at all, for maximum hygiene and ease of cleaning.

With reference to Figure 1 and Figure 2, the assembled breast pump system 100 includes  
20 a housing 1 shaped to substantially fit inside a bra. The housing 1 includes one or more pumps and a rechargeable battery. The breast pump system includes two parts that are directly connected to the housing 1: the breast shield 7 and a milk container 3. The breast shield 7 and the milk container 3 are directly removable or attachable from the housing 1 in normal use or during normal dis-assembly (most clearly shown in Figure 5). All other  
25 parts that are user-removable in normal use or during normal dis-assembly are attached to either the breast shield 7 or the milk container 3. The breast shield 7 and milk container 3 may be removed or attached for example using a one click or one press action or a push button or any other release mechanism. Audible and/or haptic feedbacks confirm that the pump is properly assembled.

30

The modularity of the breast pump allows for easy assembly, disassembly and replacement of different parts such as the breast shield and milk collection container. This also allows for different parts of the pump to be easily washed and/or sterilised. The breast shield and bottle assembly, both of which are in contact with milk during

pumping, may therefore be efficiently and easily cleaned; these are the only two items that need to be cleaned; in particular, the housing does not need to be cleaned.

5 The housing 1, breast shield 7 that is holding a flexible diaphragm, and milk container 3 attach together to provide a closed-loop pneumatic system powered by piezoelectric pumps located in the housing 1. This system then applies negative pressure directly to the nipple, forms an airtight seal around the areola, and provides a short path for expressed milk to collect in an ergonomically shaped milk container 3.

10 The different parts of the breast shield system are also configured to automatically self-seal under negative pressure for convenience of assembly and disassembly and to reduce the risk of milk spillage. Self-sealing refers to the ability of sealing itself automatically or without the application of adhesive, glue, or moisture (such as for example a self-sealing automobile tire or self-sealing envelopes). Hence once the breast pump system is  
15 assembled it self-seals under its assembled condition without the need to force seals into interference fits to create sealed chambers. A degree of interference fitting is usual however, but is not the predominating attachment mechanism. Self-sealing enables simple components to be assembled together with a light push: for example, the diaphragm just needs to be placed lightly against the diaphragm housing; it will self-seal  
20 properly and sufficiently when the air-pump applies sufficient negative air-pressure. The diaphragm itself self-seals against the housing when the breast shield is pushed into the housing. Likewise, the breast shield self-seals against the milk container when the milk container is pushed up to engage the housing. This leads to simple and fast assembly and dis-assembly, making it quick and easy to set the device up for use, and to clean the  
25 device after a session.

Self-sealing has a broad meaning and may also relate to any, wholly or partly self-energising seals. It may also cover any interference seals, such as a press seal or a friction seal, which are achieved by friction after two parts are pushed together.

30

Whilst one particular embodiment of the invention's design and a specific form of each of the parts of the breast pump system is detailed below, it can be appreciated that the overall description is not restrictive, but an illustration of topology and function that the design will embody, whilst not necessary employing this exact form or number of

discrete parts.

The breast pump system 100 comprises a housing 1 and a milk collection container (or bottle) 3. The housing 1 (including the one or more pumps and a battery) and the container 3 are provided as a unit with a convex outer surface contoured to fit inside a bra. The milk collection container 3 is attached to a lower face 1A of the housing 1 and forms an integral part of the housing when connected, such that it can be held comfortably inside a bra. While the breast pump 100 may be arranged to be used with just the right or the left breast specifically, the breast pump 100 is preferably used with both breasts, without modification. To this end, the outer surfaces of the breast pump 100 are preferably substantially symmetrical.

Preferably, the width of the complete breast pump device (housing 1 and milk container 3) is less than 110 mm and the height of the complete breast pump device is less than 180 mm.

Overall, the breast pump system 100 gives discrete and comfortable wear and use. The system weighs about 224 grams when the milk container is empty, making it relatively lighter as compared to current solutions; lightness has been a key design goal from the start, and has been achieved through a lightweight piezo pump system and engineering design focussed on minimising the number of components.

The breast pump system 100 is small enough to be at least in part held within any bra without the need to use a specialized bra, such as a maternity bra or a sports bra. The rear surface of the breast pump is also concave so that it may sit comfortably against the breast. The weight of the system has also been distributed to ensure that the breast pump is not top heavy, ensuring comfort and reliable suction against the breast. The centre of gravity of the pump system is, when the container is empty, substantially at or below the horizontal line that passes through the filling point on the breast shield, so that the device does not feel top-heavy to a person while using the pump.

Preferably, when the container is empty, the centre of gravity is substantially at or below the half-way height line of the housing so that the device does not feel top-heavy to a user using the pump.

The centre of gravity of the breast pump, as depicted by Figure 1, is at around 60mm high on the centreline from the base of the breast pump when the milk container is empty. During normal use, and as the milk container gradually receives milk, the centre of gravity lowers, which increases the stability of the pump inside the bra. It reduces to  
5 around 40mm high on the centreline from the base of the breast pump when the milk container is full.

The centre of gravity of the breast pump is at about 5.85mm below the centre of the nipple tunnel when the milk container is empty, and reduced to about 23.60mm below the centre of the nipple tunnel when the milk container is full. Generalising, the centre of  
10 gravity should be at least 2mm below the centre of the nipple tunnel when the container is empty.

The breast pump 100 is further provided with a user interface 5. This may take the form of a touchscreen and/or physical buttons. In particular, this may include buttons, sliders, any form of display, lights, or any other componentry necessary to control and indicate  
15 use of the breast pump 100. Such functions might include turning the breast pump 100 on or off, specifying which breast is being pumped, increasing or decreasing the peak pump pressure. Alternatively, the information provided through the user interface 5 might also be conveyed through haptic feedback, such as device vibration, driven from a miniature vibration motor within the pump housing 1.

20

In the particular embodiment of the Figures, the user interface 5 comprises power button 5A for turning the pump on and off. The user interface 5 further comprises pump up button 5B and pump down button 5C. These buttons adjust the pressure generated by the pump and hence the vacuum pressure applied to the user's breast. In  
25 preferable embodiments, the pump up button 5B could be physically larger than the pump down button 5C. A play/pause button 5D is provided for the user to interrupt the pumping process without turning the device off.

The user interface 5 further comprises a breast toggle button 5E for the user to toggle a  
30 display of which breast is being pumped. This may be used for data collection, e.g. via an application running on a connected smartphone; the app sends data to a remote server, where data analysis is undertaken (as discussed in more detail later), or for the user to keep track of which breast has most recently been pumped. In particular, there may be a

pair of LEDs, one to the left of the toggle button 5E and one to the right. When the user is pumping the left breast, the LED to the right of the toggle button 5E will illuminate, so that when the user looks down at the toggle it is the rightmost LED from their point of view that is illuminated. When the user then wishes to switch to the right breast, the toggle button can be pressed and the LED to the left of the toggle button 5E, when the user looks down will illuminate. The connected application can automatically track and allocate how much milk has been expressed, and when, by each breast.

The breast pump system also comprises an illuminated control panel, in which the level of illumination can be controlled at night or when stipulated by the user. A day time mode, and a less bright night time mode that are suitable to the user, are available. The control of the illumination level is either implemented in hardware within the breast pump system itself or in software within a connected device application used in combination with the breast pump system.

As depicted in Figure 1, the housing 1 and milk collection container 3 form a substantially continuous outer surface, with a generally convex shape. This shape roughly conforms with the shape of a 'tear-drop' shaped breast. This allows the breast pump 100 to substantially fit within the cup of a user's bra. The milk collection container 3 is retained in attachment with the housing 1 by means of a latch system, which is released by a one-click release mechanism such as a push button 2 or any other one-handed release mechanism. An audible and/or haptic feedback may also be used to confirm that the milk collection container 3 has been properly assembled.

The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting an additional 2 cm difference. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes of S, M, L, XL, etc. In preferred embodiments, the breast pump 100 of the present invention corresponds to an increase of between 3 or 4 cup sizes of the user according to EN 13402.

A plane-to-plane depth of the breast pump can also be defined. This is defined as the distance between two parallel planes, the first of which is aligned with the innermost

point of the breast pump 100, and the second of which is aligned with the outermost point of the breast pump 100. This distance is preferably less than 100 mm.

Figure 2 is a rear view of the breast pump 100 of Figure 1. The inner surface of the housing 1 and milk collection container 3 are shown, along with a breast shield 7. The housing 1, milk collection container 3 and breast shield 7 form the three major subcomponents of the breast pump system 100. In use, these sub-components clip together to provide the functioning breast pump system 100. The breast shield 7 is designed to engage with the user's breast, and comprises a concave inner flange 7A which contacts the breast. To allow the breast pump 100 to be used on either of the user's breasts, the breast shield 7 is preferably substantially symmetrical on its inner flange 7A.

The inner flange 7A is substantially oval-shaped. While the inner flange 7A is concave, it is relatively shallow such that it substantially fits the body form of the user's breast. In particular, when measured side-on the inner-most point of the flange 7A and the outermost point may be separated by less than 25 mm. By having a relatively shallow concave surface, the forces applied can be spread out over more surface area of the breast. The flatter form also allows easier and more accurate location of the user's nipple. In particular, the flange 7A of the breast shield 7 may extend over the majority of the inner surface of the housing 1 and milk collection container 3. Preferably, it may extend over 80% of this surface. By covering the majority of the inner surface, the breast shield is the only component which contact's the wearer's breast. This leaves fewer surfaces which require thorough cleaning as it reduces the risk of milk contacting a part of the device which cannot be easily sterilized. Additionally, this also helps to disperse the pressure applied to the user's breast across a larger area.

The breast shield 7 substantially aligns with the outer edge 1B of the housing 1. The milk collection container 3 may be provided with an arcuate groove for receiving a lower part of the breast shield 7. This is best shown in later Figures. In the assembled arrangement of Figures 1 and 2, the inner surface of the breast pump 100 is substantially continuous.

The breast shield 7 comprises a shield flange for engaging the user's breast, and an elongate nipple tunnel 9) aligned with the opening and extending away from the user's



breast. Breast shield nipple tunnel 9 extends from a curved section 7B in the breast shield 7. In preferable embodiments the nipple tunnel 9 is integral with the breast shield 7. However, it is appreciated that separate removable/interchangeable nipple tunnels may be used. Curved section 7B is positioned over the user's nipple and areola in use. The breast shield 7 forms an at least partial seal with the rest of the user's breast around this portion, under the negative air pressure created by an air-pressure pump.

This breast shield nipple tunnel 9 defines a milk-flow path from the inner surface of the breast shield 7A, through the breast shield nipple tunnel 9 and into the milk collection container 3. The breast shield nipple tunnel 9 is preferably quite short in order to minimise the length of the milk-flow path in order to minimise losses. By reducing the distance covered by the milk, the device is also reduced in size and complexity of small intermediate portions. In particular, the breast shield nipple tunnel 9 may extend less than 70 mm from its start to end, more preferably less than 50 mm. In use, the nipple tunnel 9 is substantially aligned with the user's nipple and areolae. The nipple tunnel comprises a first opening 9A for depositing milk into the collection container and a second opening 19A for transferring negative air pressure generated by the pump to the user's nipple.

The shield flange 7A and nipple tunnel 9 may be detachable from the housing 1 together. The shield flange 7A and nipple tunnel 9 being detachable together helps further simplify the design, and reduce the number of components which must be removed for cleaning and sterilization. However, preferably, the nipple tunnel 9 will be integral with the breast shield 7, in order to simplify the design and reduce the number of components which must be removed for cleaning and sterilisation.

Figures 3 and 4 are of a partially disassembled breast pump 100 of the present invention. In these Figures, the breast shield 7 has been disengaged from the housing 1 and milk collection bottle 3. As shown in Figure 4, the housing 1 comprises a region or slot 11 for receiving the breast shield nipple tunnel 9 of the breast shield 7. The breast shield is held in place thanks to a pair of channels (9B) included in the nipple tunnel 9, each channel including a small indent. When pushing the housing 1 onto the breast shield 7, which has been placed over the breast, ridges in the housing (9C) engage with the channels, guiding the housing into position; a small, spring plunger, such as ball bearing in each

ridge facilitates movement of the housing on to the nipple tunnel 9. The ball bearings locate into the indent to secure the housing on to the nipple tunnel with a light clicking sound. In this way, the user can with one hand place and position the breast shield 7 onto her breast and with her other hand, position and secure the housing 1 on to the breast shield 7. The breast shield 7 can be readily separated from the housing 1 since the ball bearing latch only lightly secures the breast shield 7 to the housing 1.

Alternatively, the breast shield 7 may also be held in place by means of a clip engaging with a slot located on the housing. The clip may be placed at any suitable point on the shield 7, with the slot in a corresponding location.

The breast shield nipple tunnel 9 of the breast shield 7 is provided with an opening 9A on its lower surface through which expressed milk flows. This opening 9A is configured to engage with the milk collection bottle 3.

The breast pump 100 further comprises a barrier or diaphragm for transferring the pressure from the pump to the milk-collection side of the system. In the depicted example, this includes flexible rubber diaphragm 13 seated into diaphragm housing 19A. The barrier could be any other suitable component such as a filter or an air transmissive material. Diaphragm housing 19A includes a small air hole into the nipple tunnel 9 to transfer negative air pressure into nipple tunnel 9 and hence to impose a sucking action on the nipple placed in the nipple tunnel 9.

Hence, the air pump acts on one side of the barrier or diaphragm 13 to generate a negative air pressure on the opposite, milk-flow side of the barrier. The barrier has an outer periphery or surface, i.e. the surface of diaphragm housing 19A that faces towards the breast, and the milk-flow pathway extends underneath the outer periphery or surface of the barrier or diaphragm housing 19A. The milk-flow path extending under the outer periphery or surface of the barrier 19A allows for a simpler and more robust design, without the milk-flow pathway extending through the barrier. This provides increased interior space and functionality for the device.

As noted, the milk-flow pathway extends beneath or under the barrier 13 or surface of diaphragm housing 19A. This provides an added benefit of having gravity move the milk down and away from the barrier.

Preferably the milk-flow pathway does not pass through the barrier 32. This results in a simpler and smaller barrier design.

5 As noted, the diaphragm 13 is mounted on diaphragm housing 19A that is integral to the breast shield. This further helps increase the ease of cleaning and sterilisation as all of the components on the “milk” flow side can be removed.

10 The barrier 13 may also provide a seal to isolate the air pump from the milk-flow side of the barrier. This helps to avoid the milk becoming contaminated from the airflow or pumping side (i.e. the non-milk-flow side).

15 Alternatively, the only seal is around an outer edge of the barrier 13. This is a simple design as only a single seal needs to be formed and maintained. Having multiple seals, such as for an annular membrane, introduces additional complexity and potential failure points.

20 As illustrated in Figures 3 and 4, the barrier may include a flexible diaphragm 13 formed by a continuous circular disc shaped membrane which is devoid of any openings or holes. This provides a larger effective “working” area of the diaphragm (i.e. the area of the surface in contact with the pneumatic gasses) than an annular membrane and hence the membrane may be smaller in diameter to have the same working area.

25 The diaphragm 13 is arranged so that the milk-flow pathway extends below and past the outer surface or periphery of the diaphragm 13. This means that the milk-flow pathway does not extend through the diaphragm 13. In particular, the milk-flow pathway is beneath the diaphragm 13. However, the diaphragm 13 may be offset in any direction with respect to the milk-flow pathway, provided that the milk-flow pathway does not extend through the diaphragm 13.

30

Preferably, the diaphragm 13 is a continuous membrane, devoid of any openings. The diaphragm 13 is held in a diaphragm housing 19, which is formed in two parts. The first half 19A of the diaphragm housing 19 is provided on the outer surface of the breast shield 7, above the breast shield nipple tunnel 9 and hence the milk-flow pathway. In

preferred embodiments, the first half 19A of the diaphragm housing 19 is integral with the breast shield. The second half 19B of the diaphragm housing is provided in a recessed portion of the housing 1. The diaphragm 13 self-seals in this diaphragm housing 19 around its outer edge, to form a watertight and airtight seal. Preferably, the self-seal  
5 around the outer edge of the diaphragm 13 is the only seal of the diaphragm 13. This is beneficial over systems with annular diaphragms which must seal at an inner edge as well. Having the diaphragm 13 mounted in the breast pump 100 in this manner ensures that it is easily accessible for cleaning and replacement. It also ensures that the breast shield 7 and diaphragm 13 are the only components which need to be removed from the pump  
10 100 for cleaning. Because the diaphragm 13 self-seals under vacuum pressure, it is easily removed for cleaning when the device is turned off.

Figures 5 and 6 show a breast pump 100 according to the present invention in a further disassembled state. In addition to the breast shield 7 and diaphragm 13 being removed,  
15 the milk collection container 3 has been unclipped. Preferably, the milk collection container 3 is a substantially rigid component. This ensures that expressed milk does not get wasted, while also enhancing re-usability. In some embodiments, the milk collection container 3 may be formed of three sections: a front bottle portion, a rear bottle portion, and a cap. These three sections may clip together to form the milk collection container 3.  
20 This three-part system is easy to empty, easily cleanable since it can be dis-assembled, and easily re-usable. The milk collection container or milk bottle may be formed of at least two rigid sections which are connectable. This allows simple cleaning of the container for re-use. Alternatively, the container may be a single container made using a blow moulding construction, with a large opening to facilitate cleaning. This large  
25 opening is then closed with a cap with an integral spout 35 or 'sealing plate' (which is bayonet-mounted and hence more easily cleaned than a threaded mount spout). A flexible rubber valve 37 (or 'sealing plate seal') is mounted onto the cap or spout 35 and includes a rubber duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump; this ensures that negative air-pressure does not need to be  
30 applied to the milk container and hence adds to the efficiency of the system. The flexible valve 37 self-seals against opening 9A in nipple tunnel 9. Because it self-seals under vacuum pressure, it automatically releases when the system is off, making it easy to remove the milk container.

Preferably, the milk collection container resides entirely below the milk flow path defined by the breast shield when the breast pump system 100 is positioned for normal use, hence ensuring fast and reliable milk collection.

5 The milk collection container 3 has a capacity of approximately 5 fluid ounces (148 ml). Preferably, the milk collection container has a volume of greater than 120 ml. More preferably, the milk collection container has a volume of greater than 140 ml. To achieve this, the milk collection container 3 preferably has a depth in a direction extending away from the breast in use, of between 50 to 80 mm, more preferably between 60 mm to 70  
10 mm, and most preferably between 65 mm to 68 mm.

The milk collection container 3 further preferably has a height, extending in the direction from the bottom of the container 3 in use to the cap or spout or sealing plate 35, of between 40 mm to 60 mm, more preferably between 45 mm to 55 mm, and most  
15 preferably between 48 mm to 52 mm. The cap 35 may screw into the milk collection bottle 3. In particular, it may be provided with a threaded connection or a bayonet and slot arrangement.

Further preferably, the milk collection container has a length, extending from the  
20 leftmost point to the rightmost point of the container 3 in use, of between 100 mm to 120 mm, more preferably between 105 mm to 115 mm, and most preferably between 107 mm to 110 mm.

This cap 35 is provided with a one-way valve 37, through which milk can flow only into  
25 the bottle. This valve 37 prevents milk from spilling from the bottle once it has been collected. In addition, the valve 37 automatically seals completely unless engaged to the breast shield 7. This ensures that when the pump 100 is dismantled immediately after pumping, no milk is lost from the collection bottle 3. It can be appreciated that this one-way valve 37 might also be placed on the breast shield 7 rather than in this bottle cap 35.

30

Alternatively, the milk bottle 3 may form a single integral part with a cap 35. Cap 35 may include an integral milk pouring spout.

In certain embodiments, a teat may be provided to attach to the annular protrusion 31A

or attach to the spout that is integral with cap 35, to allow the container 3 to be used directly as a bottle. This allows the milk container to be used directly as a drinking vessel for a child. The milk collection container may also be shaped with broad shoulders such that it can be adapted as a drinking bottle that a baby can easily hold.

5

Alternatively, or in addition, a spout may be provided to attach to the protrusion 31A for ease of pouring. A cap may also be provided to attach to the protrusion 31A in order to seal the milk collection bottle 3 for easy storage.

10 The pouring spout, drinking spout, teat or cap may also be integral to the milk collection container.

Further, the removable milk collection container or bottle includes a clear or transparent wall or section to show the amount of milk collected. Additionally, measurement  
15 markings (3A) may also be present on the surface of the container. This allows the level of milk within the container to be easily observed, even while pumping. The milk collection container or bottle may for example be made using an optically clear, dishwasher safe polycarbonate material such as Tritan™.

20 The milk collection container or bottle may include a memory or a removable tag, such as a tag including an NFC chip, that is programmed to store the date and time it was filled with milk, using data from the breast pump system or a connected device such as a smartphone. The container therefore includes wireless connectivity and connects to a companion app. The companion app then tracks the status of multiple milk collection  
25 containers or bottles to select an appropriate container or bottle for feeding. The tag of the bottle may also be programmed to store the expiry date of the milk as well as the quantity of the milk stored.

Figures 7 and 8 show front views of a breast pump system 100. The outer-surface of the  
30 housing 1 has been drawn translucent to show the components inside. The control circuitry 71 for the breast pump 100 is shown in these figures. The control circuitry in the present embodiment comprises four separate printed circuit boards, but it is appreciated that any other suitable arrangement may be used.

The control circuitry may include sensing apparatus for determining the level of milk in the container 3. The control circuitry may further comprise a wireless transmission device for communicating over a wireless protocol (such as Bluetooth) with an external device. This may be the user's phone, and information about the pumping may be sent to this device. In embodiments where the user interface comprises a breast toggle button 5E, information on which breast has been selected by the user may also be transmitted with the pumping information. This allows the external device to separately track and record pumping and milk expression data for the left and right breasts.

There should also be a power charging means within the control circuitry 71 for charging the battery 81. While an external socket, cable or contact point may be required for charging, a form of wireless charging may instead be used such as inductive or resonance charging. In the Figures, charging port 6 is shown for charging the battery 81. This port 6 may be located anywhere appropriate on the housing 1.

Figure 8 shows the location of the battery 81 and the pumps 83A, 83B mounted in series inside the housing 1. While the depicted embodiment shows two pumps 83A, 83B it is appreciated that the present invention may have a single pump. Preferably, an air filter 86 is provided at the output to the pumps 83A, 83B. In preferable embodiments, the pumps 83A, 83B are piezoelectric air pumps (or piezo pumps), which operate nearly silently and with minimal vibrations. A suitable piezo pump is manufactured by TTP Ventus, which can deliver in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free flow. The rear side of the second half of the diaphragm housing 19B in the housing 1 is provided with a pneumatic connection spout. The pumps 83A, 83B are pneumatically connected with this connection spout.

Operation of the breast pump 100 will now be described. Once the breast pump 100 is activated and a pumping cycle is begun, the pumps 83A, 83B generates a negative air pressure which is transmitted via an air channel to a first side of the diaphragm 13 mounted on the diaphragm housing 19A. This side of the diaphragm 13 is denoted the pumping side 13B of the diaphragm 13.

The diaphragm 13 transmits this negative air pressure to its opposite side (denoted the milk-flow side 13A). This negative pressure is transferred through a small opening in the

diaphragm housing 19A to the breast shield nipple tunnel 9 and the curved opening 7B of the breast shield 7 that contacts the breast. This acts to apply the pressure cycle to the breast of the user, in order to express milk. The milk is then drawn through the nipple tunnel 9, to the one way valve 37 that remains closed whilst negative pressure is applied.

5 When the negative air pressure is released, the valve 37 opens and milk flows under gravity past the valve 37 and into milk container 3. Negative air pressure is periodically (e.g. cyclically, every few seconds) applied to deliver pre-set pressure profiles such as profiles that imitate the sucking of a child.

10 While the depicted embodiment of the breast pump 100 is provided with two pumps, the following schematics will be described with a single pump 83. It is understood that the single pump 83 could be replaced by two separate piezo air-pumps 83A, 83B as above.

Figure 9 depicts a schematic of a further embodiment of a breast shield nipple tunnel 9  
15 for a breast pump 100. The breast shield nipple tunnel 9 is provided with an antechamber 91 and a separation chamber 93. A protrusion 95 extends from the walls of the breast shield nipple tunnel 9 to provide a tortuous air-liquid labyrinth path through the breast shield nipple tunnel 9. In the separation chamber 93 there are two opening 97, 99. An air opening 97 is provided in an upper surface 93A of the separation chamber 93.  
20 This upper surface 93 is provided transverse to the direction of the breast shield nipple tunnel 9. This opening 97 connects to the first side of the diaphragm housing 19A and is the source of the negative pressure. This airflow opening 97 also provides a route for air to flow as shown with arrow 96. It is appreciated that the tortuous pathway is not  
25 necessary and that a breast shield nipple tunnel 9 without such a pathway will work.

The other opening 99 is a milk opening 99. The milk opening 99 is provided on a lower surface 93B of the separation chamber 93 and connects in use to the container 3. After flowing through the tortuous breast shield nipple tunnel 9 pathway, the milk is encouraged to flow through this opening 99 into the container 3. This is further aided by  
30 the transverse nature of the upper surface 93A. In this manner, expressed milk is kept away from the diaphragm 13. As such, the breast pump 100 can be separated into a “air” side comprising the pump 83, the connection spout 85 and the pumping side 13B of the diaphragm 13 and a “milk-flow” side comprising the breast shield 7, the milk collection container 3 and the milk-flow side 13A of the diaphragm 13. This ensures that all of the



“milk-flow” components are easily detachable for cleaning, maintenance and replacement. Additionally, the milk is kept clean by ensuring it does not contact the mechanical components. While the present embodiment discusses the generation of negative pressure with the pump 83, it will be appreciated that positive pressure may  
5 instead be generated.

While the embodiments described herein use a diaphragm 13, any suitable structure to transmit air pressure while isolating either side of the system may be used.

10 The breast pump may further comprise a pressure sensor in pneumatic connection with the piezo pump. This allows the output of the pump to be determined.

Figure 10 shows a schematic of a basic pneumatic system 200 for a breast pump 100. In the system 200 milk expressed into the breast shield 7 is directed through the breast  
15 shield nipple tunnel 9 through the torturous air-liquid labyrinth interface 95. The milk is directed through the non-return valve 37 to the collection container 3. This side of the system forms the “milk-flow” side 201.

The rest of the pneumatic system 200 forms the air side 202 and is separated from  
20 contact with milk. This is achieved by way of a flexible diaphragm 13 which forms a seal between the two sides of the system. The diaphragm 13 has a milk-flow side 13A and an air side or pumping side 13B.

The air side 202 of the system 200 is a closed system. This air side 202 may contain a  
25 pressure sensor 101 in pneumatic connection with the diaphragm 13 and the pump 83. Preferably, the pump 83 is a piezoelectric pump (or piezo pump). Due to their low noise, strength and compact size, piezoelectric pumps are ideally suited to the embodiment of a small, wearable breast pump. The pump 83 has an output 83A for generating pressure, and an exhaust to the atmosphere 83B. In a first phase of the expression cycle, the pump  
30 83 gradually applies negative pressure to half of the closed system 202 behind the diaphragm 13. This causes the diaphragm 13 to extend away from the breast, and thus the diaphragm 13 conveys a decrease in pressure into the breast shield 7. The reduced pressure encourages milk expression from the breast, which is directed through the tortuous labyrinth system 95 and the one-way valve 37 to the collection bottle 3.

While in the depicted embodiment the air exhaust 83B is not used, it may be used for functions including, but not limited to, cooling of electrical components, inflation of the bottle to determine milk volume (discussed further later) or inflation of a massage bladder or liner against the breast. This massage bladder may be used to help mechanically encourage milk expression. More than one massage bladder may be inflated regularly or sequentially to massage one or more parts of the breast. Alternatively, the air pump may be used to provide warm air to one or more chambers configured to apply warmth to one or more parts of the breast to encourage let-down.

The air side 202 further comprises a two-way solenoid valve 103 connected to a filtered air inlet 105 and the pump 83. Alternatively, the filter could be fitted on the pump line 83A. If the filter is fitted here, all intake air is filtered but the performance of the pump may drop. After the negative pressure has been applied to the user's breast, air is bled into the system 202 through the valve 103 in a second phase of the expression cycle. In this embodiment, the air filter 105 is affixed to this inlet to protect the delicate components from degradation. In particular, in embodiments with piezoelectric components, these are particularly sensitive.

The second phase of the expression cycle and associated switching of valve 103 is actioned once a predefined pressure threshold has been reached. The pressure is detected by a pressure sensor 101.

In certain embodiments, if the elasticity and extension of the diaphragm 13 may be approximated mathematically at different pressures, the pressure measured by sensor 101 can be used to infer the pressures exposed to the nipple on the opposite side of the diaphragm 13. Figure 11 shows an alternative pneumatic system 300. The core architecture of this system is the same as the system shown in Figure 10.

In this system 300, the closed loop 202 is restricted with an additional three way solenoid valve 111. This valve 111 allows the diaphragm 13 to be selectively isolated from the rest of the closed loop 202. This additional three way valve 111 is located between the diaphragm 13 and the pump 83. The pressure sensor 101 is on the pump 83 side of the three way valve 111. The three way valve 111 is a single pole double throw (SPDT) valve,

wherein: the pole 111A is in pneumatic connection with the pump 83 and pressure sensor; one of the throws 11 is in pneumatic connection with the diaphragm 13; and the other throw 111C is in pneumatic connection with a dead-end 113. This dead-end 113 may either be a simple closed pipe, or any component(s) that does not allow the flow of  
5 air into the system 202. This could include, for example, an arrangement of one-way valves.

In this system 300, therefore, the pump 83 has the option of applying negative pressure directly to the pressure sensor 101. This allows repeated testing of the pump in order to  
10 calibrate pump systems, or to diagnose issues with the pump in what is called a dead end stop test. This is achieved by throwing the valve to connect the pump 83 to the dead end 113. The pump 83 then pulls directly against the dead end 113 and the reduction of pressure within the system can be detected by the pressure sensor 101.

15 The pressure sensor detects when pressure is delivered and is then able to measure the output of the pumping mechanism. The results of the pressure sensor are then sent to an external database for analysis such as a cloud database, or are fed back to an on-board microcontroller that is located inside the housing of the breast pump system.

Based on the pressure sensor measurements, the breast pump system is able to  
20 dynamically tune the operation of the pumping mechanism (i.e. the duty or pump cycle, duration of a pumping session, the voltage applied to the pumping mechanism, the peak negative air pressure) in order to ensure a consistent pressure performance across different breast pump systems.

In addition, the breast pump system, using the pressure sensor measurements, is able to  
25 determine if the pump is working correctly, within tolerance levels. Material fatigue of the pump is therefore directly assessed by the breast pump system. Hence, if the output of the pumping mechanism degrades over time, the breast pump system can tune the pumping mechanism operation accordingly. As an example, the breast pump system may increase the duration of a pumping session or the voltage applied to the pumping  
30 mechanism to ensure the expected pressures are met.

This ensures that the user experience is not altered, despite the changing output of the pump as it degrades over time. This is particularly relevant for piezo pumps where the output of the pump may vary significantly.

The microcontroller can also be programmed to deliver pre-set pressure profiles. The pressure profiles may correspond to, but not necessarily, any suction patterns that would mimic the sucking pattern of an infant. The patterns could mimic for example the sucking pattern of a breastfed infant during a post birth period or at a later period in  
5 lactation.

The profiles can also be manually adjusted by the user using a control interface on the housing of the breast pump system or on an application running on a connected device.

10 Additionally, the user is able to manually indicate the level of comfort that they are experiencing when they are using the system. This can be done using a touch or voice-based interface on the housing of the breast pump system itself or on an application running on a connected device.

15 The system stores the user-indicated comfort levels together with associated parameters of the pumping system. The pressure profiles may then be fine scaled in order to provide the optimum comfort level for a particular user.

The profiles or any of the pumping parameters may be calculated in order to correlate with maximum milk expression rate or quantity.

20 The pressure profiles or any of the pumping parameters may also be dynamically adjusted depending on the real time milk expression rate or quantity of milk collected. The pressure profiles or any of the pumping parameters may also be dynamically adjusted when the start of milk let-down has been detected.

25 Additionally, the system is also able to learn which parameters improve the breast pump system efficiency. The system is able to calculate or identify the parameters of the pumping mechanism that correlate with the quickest start of milk let-down or the highest volume of milk collected for a certain time period. The optimum comfort level for a  
30 particular user may also be taken into account.

Figure 12 shows a schematic for a system 400 for a breast pump 100 which can estimate the volume of milk collected in the collection container 3 from data collected on the air-side part 202 of the system 400.

The pump 83 is connected to the circuit via two bleed valves 126, 128. The first bleed valve 126 is arranged to function when the pump 83 applies a negative pressure. As such, this valve 126 is connected to a “bleed in” 127, for supplying atmospheric air to the system 202.

The second bleed valve 128 is arranged to function when the pump 83 applies a positive pressure. As such, this valve 128 is connected to a “bleed out” 129 for bleeding air in the system 202 to the atmosphere.

Although Section C describes the preferred embodiment for measuring or inferring the volume of milk collected in the milk collection container using IR sensors, an alternative method for measuring or inferring the volume of milk collected in the milk collection container using pressure sensors is described also below.

During a milking pump cycle, the pump 83 applies negative pressure on the air side 13B of the diaphragm 13 which causes its extension towards the pump 83. This increases the volume of the space on the milk side 13B of the diaphragm 13. This conveys the decrease in pressure to the breast to encourage expression of milk. A set of three non-return valves 121, 123, 125 ensure that this decrease in pressure is applied only to the breast (via the breast shield 7) and not the milk collection container 3. To measure the volume of milk collected in the container 3, the pump 83 is used instead to apply positive pressure to the diaphragm 13. The diaphragm 13 is forced to extend away from the pump 83 and conveys the pressure increase to the milk side 201 of the system 400. The three non-return valves 121, 123, 125 ensure that this increase in pressure is exclusively conveyed to the milk collection container 13.

The breast pump may further comprise: a first non-return valve between the milk flow side of the diaphragm and the breast shield, configured to allow only a negative pressure to be applied to the breast shield by the pump; a second non-return valve between the milk-flow side of the diaphragm and the milk collection container configured to allow only a positive pressure to be applied to the milk collection container by the pump; and a pressure sensor in pneumatic connection with the pressure-generation side of the diaphragm.

The resulting pressure increase is monitored behind the diaphragm 13 from the air-side 202 by a pressure sensor 101. Preferably, the pressure sensor 101 is a piezoelectric pressure sensor (piezo pressure sensor). The rate at which the pump 83 (at constant strength) is able to increase the pressure in the system 400 is a function of the volume of air that remains in the milk collection container 3. As air is many times more compressible than liquid, the rate at which pressure increases in the system 400 can be expressed as an approximate function of the volume of milk held in the collection container 3.

10

Thus by increasing the pressure in this fashion, the rate of pressure increase can be determined, from which the volume of milk held in the container 3 is calculable. Figure 13 shows repeated milking and volume measurement cycles as the collection container 3 is filled. To determine the rate of pressure increase the pump 83 was run for a fixed time. As pumping proceeds and the volume of air reduces in the system 400, the pump 83 is able to achieve a higher pressure. Each milking cycle is represented by a positive pressure spike 41. There is a clear upwards trend 43 in magnitude of positive pressures achieved as the collection container 3 is filled.

15

A method of estimating the pressure applied by a breast pump may comprise the steps of: selecting a pressure cycle from a pre-defined list of pressure cycles; applying pressure with the pump to stimulate milk expression; reading the output of the pressure sensor; and adjusting the applied pressure of the pump to match the pressure profile selected. This allows for repeatable application of force to the breast, even as the pump performance degrades.

20

Preferably the method further comprises the steps of: approximating the elasticity and extension of the diaphragm at the relevant pressure; and calculating an estimated applied pressure based upon the output of the pressure sensor and the approximated elasticity and extension of the diaphragm.

25

Alternatively, a method of estimating the milk collected by a breast pump may comprise the steps of: generating a positive pressure with the pump; transmitting the positive pressure via the diaphragm and second non-return valve to only the milk collection

container; measuring the increase in pressure by the pressure sensor in pneumatic connection with the diaphragm; estimating the volume of milk inside the milk collection container based upon the rate of increase of pressure. In this manner, the volume of milk can be estimated remotely.

5

In this manner, an estimate can be obtained for the volume of milk in the container 3 based upon the measured pressures.

10

Figure 13 also shows a dead end stop pump test 45 as described above. The negative spike shows the application of negative pressure directly to the pressure sensor 101.

## **2. Breast shield sizing and nipple alignment**

15

The correct sizing of the breast shield and the alignment of the nipple in the breast shield are key for an efficient and comfortable use of the breast pump. However breast shape, size as well as nipple size and position on the breast vary from one person to another and one breast from another. In addition, women's bodies often change during the pumping life cycle and consequently breast shield sizing may also need to be changed. Therefore, a number of breast shield sizes are available. Guide lines for correct nipple alignment are also provided.

20

With reference to Figure 14, three breast shield sizes are shown (A1, B1, C1). The substantially clear breast shield gives an unobstructed view of the breast and allows a user to easily confirm that she has the appropriate sized shield for her breast.

25

In order to determine the correct breast shield size and nipple alignment, the breast shield and the diaphragm are detached from the housing and placed on the breast with the sizing symbol facing upwards (with the diaphragm positioned below the nipple) and the nipple aligned in the centre of the fit lines (as shown in A2, B2, C2). The transparent breast shield allows the user to observe the nipple while adjusting the position of the breast shield in order to align the nipple correctly near the centre of the breast shield nipple tunnel. Prior to using the pump, the nipple is aligned correctly, and the breast shield is pushed into place ensuring the seal is correctly positioned on the breast shield. The fit lines should be directly aligned with the outside of the nipple. The correct

30

alignment is illustrated B2.

When the nipple is correctly aligned, the user then rotates the breast shield in order for the diaphragm to be positioned on top of the nipple. The user may then quickly assemble the rest of the breast pump (i.e. the housing and the milk container) on the breast shield via a one-click attachment mechanism confirming correct engagement, which may be performed one-handed. Nipple alignment may therefore be easily maintained. Audio and/or haptic feedback may also be provided to further confirm correct engagement.

10

### **3. Connected Device Application**

Figures 15 to 20 show examples of screenshots of a connected device application that may be used in conjunction with the breast pump system as described above. The interface shown here is an example only and the same data may be presented via any conceivable means including animated graphics, device notifications, audio or text descriptions.

Figure 15 shows a homepage of the application with different functions provided to the user which can be accessed either directly while pumping or at a later time in order for example: to review pump settings or the history of previous pumping sessions.

Figure 16 shows a status page with details of remaining battery life, pumping time elapsed and volume of milk inside the milk container.

Figure 17 shows screenshots of a control page, in which a user is able to control different pump parameters for a single breast pump (A) or two breast pumps (B). The user may press on the play button to either start, pause, or resume a pumping activity. The user may also directly increase or decrease the rate of expression using the (+) or (-) buttons. When only one breast is being pumped (A), the user may also indicate if it is either the right or left breast that is being pumped. The user may also control the pump peak pressure or alternatively may switch between different pre-programmed pressure profiles such as one mimicking the sucking pattern of a baby during expression or stimulation cycle.

Figure 18 shows a page providing a summary of the last recorded pumping session.



Figure 19 shows a page providing a history of previous pumping sessions. The user may scroll down through the page and visualize the data related to specific pumping sessions as a function of time.

5 The application is also capable of providing notifications relating to pumping. Figure 20 shows a screenshot of the application, in which a user is provided a notification when the milk collection bottle is full. Other generated notifications may include warnings about battery life, Bluetooth connection status or any other wireless communication status, status of miss-assembly, excessive movement or lack of expression.

10

Figure 21 shows a further example with a screenshot of an application running on a connected device. The page shows the pumping status when a user is using a double pump mode of operation with a pump on each breast. The user is able to manually control each pump individually and may start, stop or change a pumping cycle, increase  
15 or decrease each pump peak pressure, or switch between different pre-program pressure profiles such as one mimicking the sucking pattern of a baby during an expression or stimulation cycle. The application also notifies the user when a milk collection container is nearly full as shown in Figure 22.

20 Figure 23 shows a status page with an alert notifying the user that the milk collection container of the pump on the right breast is full. A message is displayed that the pump session has paused and that the milk collection container should be changed or emptied before resuming pumping.

25 With reference to Figure 24, when the left and right pump are stopped or paused, the application displays the elapsed time since the start of each session (right and left), the total volume of milk collected in each bottle.

30 With reference to Figure 25, a page summarising the last session (with a double pump mode) is displayed.

In addition to the data provided to the user, and their interactions with the application, the app will also hold data that the user does not interact with. For example, this may include data associated with pump diagnostics. In addition to all functions and sources of

data discussed above, the application may itself generate metadata associated with its use or inputs, notes or files uploaded by the user. All data handled within the mobile application can be periodically transferred to a cloud database for analysis. An alternative embodiment of the breast pump system may include direct contact between the database and the pump, so that pumping data may be conveyed directly, without the use of a smartphone application.

In addition to providing data to the cloud, the application may also provide a platform to receive data including for example firmware updates.

#### **4. Breast pump data analysis**

The discreet, wearable and fully integrated breast pump may offer live expression monitoring and intelligent feedback to the user in order to provide recommendations for improving pump efficiency or performance, user comfort or other pumping/sensing variables, and to enable the user to understand what variables correlate to good milk flow.

Examples of variables automatically collected by the device are: time of day, pump speed, pressure level setting, measured pressure, pressure cycle or duty cycle, voltage supplied to pumps, flow rate, volume of milk, tilt, temperature, events such as when let-down happens, when a session is finished. The user can also input the following variables: what side they have pump with (left or right or both), and the comfort level.

This is in part possible because the live milk volume measurement system functions reliably (as discussed in Section B). The breast pump system includes a measurement sub system including IR sensors that measures or infers milk flow into the milk container, and that enables a data analysis system to determine patterns of usage in order to optimally control pumping parameters. The generated data may then be distributed to a connected device and/or to a cloud server for analysis in order to provide several useful functions.

Figure 26 illustrates an outline of a smart breast pump system network which includes the breast pump system (100) in communication with a peripheral mobile device and application (270) and several cloud-based databases (268, 273). The breast pump system

(100) includes several sensors (262). Sensor data refers to a broad definition including data generated from any sensor or any other analogue/digital reading directly from the motherboard or any other component. However, within the embodiment detailed, these measurements include one or more of the following, but not limited to: milk volume  
5 measurements, temperature sensor readings, skin temperature sensing, pressure sensor readings, accelerometer data and user inputs through any physical device interface.

The device also contains a number of actuators, including, but not restricted to: piezoelectric pump(s), solenoid valve(s), IREDs and an LED display. Sensors and  
10 actuators within the device are coordinated by the CPU (263). In addition, any interactions, and data from these components, may be stored in memory (264).

Further to these components, the device also contains a communication chip, such as a Bluetooth chip (265) which can be used to communicate wirelessly with connected  
15 devices such as a peripheral mobile device (270). Through this connection any sensor data (267) generated in the breast pump can be sent to the connected device. This user data, along with any other metadata generated from a connected device app, can be provided to an online database which aggregates all user data (273). In addition, the communication chip will also allow the sending of user control data / firmware updates  
20 from the connected device to the breast pump system (266).

Raw data (271) collected from the measurement sub-system including sensors (262) may be analysed on a cloud database and the analysed data may be stored on the cloud (272). Through inferences provided by the analysed data, firmware updates (269) may be  
25 developed. These can be provided for download to the pump through, for example, an online firmware repository or bundled with the companion app in the connected device app store (268).

In addition, it should be appreciated that despite the sophistication of the proposed  
30 breast pump network, the breast pump still retains complete functionality without wireless integration into this network. Relevant data may be stored in the device's memory (264) which may then be later uploaded to the peripheral portion of the system when a connection is established, the connection could be via USB cable or wireless.

The measurement sub-system may analyse one or more of the following:

- the quantity of the liquid in the container above its base;
- the height of the liquid in the container above its base;
- the angle the top surface of the liquid in the container makes with respect to a  
5 baseline, such as the horizontal.

Based on whether the quantity and/or the height of the liquid in the container above its base is increasing above a threshold rate of increase, a haptic and/or visual indicator indicates if the pump is operating correctly to pump milk. For example, the visual  
10 indicator is a row of LEDs that changes appearance as the quantity of liquid increases.

The visual indicator may provide:

- an estimation of the flow rate;
- an estimation of the fill rate;
- 15 • an indication of how much of the container has been filled.

As a further example, an accelerometer may infer the amount of movement or tilt angle during a pumping session. If the tilt angle exceeds a threshold, the system warns or alerts the user of an imminent spillage, or provides the user with an alert to change position.  
20 Alternatively, the system may also stop pumping to prevent spillage, and once the tilt angle reduces below the threshold, pumping may resume automatically. By sensing the movement or title angle during a pumping session, the system may also derive the user's activity such as walking, standing or lying.

25 Many variables can affect milk expression and data analysis of these multiple variables can help mothers to achieve efficient pumping regimes and improve the overall user experience.

Therefore, the measurement sub-system measures or infers milk flow into the milk  
30 container and enables a user to understand what variables (e.g. time of day, pump setting) correlates to good milk flow. The amount of milk expressed over one or more sessions is recorded as well as additional metrics such as: time of day, pump setting, length of a single pumping session, vacuum level, cycle times, comfort, liquids consumed by the mother. Live data or feedback is then provided to the user to ensure the breast pump is

being used properly and to support the user in understanding the variables that would correspond to the specific individual optimum use of the breast pump.

Furthermore, live data can be used to automatically and intelligently affect specific pumping parameters in order to produce the most efficient pumping session. For example, if the rate of expression increases, the milking cycle might be adjusted accordingly to achieve a more efficient, or more comfortable pumping cycle.

The measurement sub-system also enables a data analysis system to determine patterns of usage in order to optimally control pumping parameters. Collected metrics are transferred through wireless connections between the pump, a connected device or app and a cloud database. Additionally, the application can also connect to other apps residing on the connected device, such as fitness app or social media app or any other apps. Further metrics may also include the behaviour or specific usage of the user associated with the connected device while using the pump (detection of vision and/or audio cues, internet usage, application usage, calls, text message).

Different aspects of pumping can be automatically changed based on dynamic sensor feedback within the breast pump device. The data analysis system is able to access real-time data of pumping sessions and may be used to perform one or more of the following functions, but not limited to:

- indicate whether the milk is flowing or not flowing,
- measure or infer the quantity and/or height of the liquid in the container above its base,
- give recommendations to the mother for optimal metrics for optimal milk flow,
- give recommendations to the mother for optimal metrics for weaning,
- give recommendations to the mother for optimal metrics for increasing milk supply (e.g. power pumping),
- give recommendations to the mother for optimal metrics if an optimal session start time or a complete session has been missed,
- automatically set metrics for the pumping mechanism, such as length of a single pumping session, vacuum level, cycle times.
- automatically stop pumping when the milk container is full,
- automatically adjust one or more pumping parameters to achieve an optimum

pumping session,

- automatically adjust one or more pumping parameters to achieve a comfortable pumping session,
- automatically change the pumping cycle from a programmed cycle to another different programmed cycle, such as from a stimulation cycle to an expression cycle.

10 In addition, sensor feedback might be used to improve the physical function of the breast pump system itself. For example, an array of piezoelectric pumps may be dynamically adjusted in response to their operating temperatures so as to optimise the total life of the component whilst maintaining peak pressures.

15 Many additional embodiments may be described for these simple feedback systems, yet the premise remains: real-time sensor feedback is used to automatically and dynamically adjust actuator function. Each feedback program may feasibly include any number and combination of data sources and affect any arrangement of actuators.

20 The data generated can also be used to generate large datasets of pumping parameters, user metadata and associated expression rates, therefore allowing the analysis of trends and the construction of associations or correlations that can be used to improve pumping efficiency, efficacy or any function related to effective milk expression. The analysis of large user datasets may yield useful general associations between pumping parameters and expression data, which may be used to construct additional feedback systems to include on firmware updates.

25 Multiple data sources can be interpreted simultaneously and several different changes to pumping might be actuated to increase pumping efficiency, user experience or optimize pump performance.

30 Collected metrics may be anonymised and exported for sharing to other apps, community or social media platforms on the connected device, or to an external products and services, such as community or social media platform. By contrasting the performance of different users in the context of associated metadata, users may be grouped into discrete 'Pumper profiles' or communities, which may then be used to

recommend, or action the most appropriate selection of intelligent feedback systems to encourage efficient expression. For example, a higher peak pressure may be recommended for women who tend to move more whilst pumping, so as to achieve more efficient expression.

**SECTION B: IR SYSTEM**

This section describes the milk detecting system used in the Elvie™ pump.

5 With reference to Figures 27 and 28, there is shown a device 270 for use in detecting the level of liquid inside a container 275. The device 270 is formed of a housing 271 in which is located a sensing assembly 272 comprising a series of optical emitters 273 (an array of three optical emitters is used on one implementation) which are relative to, and each located at a distance from, an optical receiver 274. In operation of the device as will be  
10 described, each optical emitter 273 is operable to emit radiation which is received by the optical receiver 274. In an embodiment of the invention, the series of optical emitters are each located equidistant from the optical receiver 274.

The optical emitters 273 and the optical receiver 274 from the sensing assembly 272 are  
15 located in a portion 276 of the device 270 which faces the container 275 when the device is connected to the container 275. The portion 276 of the device 270 containing the optical emitters 273 and the optical receiver 274 comprises a window 277 of material which is transparent to optical radiation. In this way, each of the optical emitters 273 and the optical receiver 274 have a line of sight through the window 277 into the container  
20 275 when the device 270 is connected thereto.

A controller 278 comprising a CPU 279 and a memory 280 is provided in the device 270 for controlling the operation of the sensing assembly 272. An accelerometer 281 is also provided in the housing 271, which is operatively connected to the controller 278.  
25 Operation of the device 270 when connected to the container 275 will now be described.

In a principal mode of operation, to determine the level L of liquid inside the container 275, the controller 278 instructs the optical emitters 273 to each emit radiation towards the surface of the liquid inside the container 275 at a given intensity. The optical receiver  
30 274 receives the reflected radiation from each optical emitter 273 via the surface of the liquid and each of these intensities is recorded by the controller.

For each operation of the sensing assembly 272, the controller 278 records the intensities of radiation emitted by each of the optical emitters 273 as intensities IE1; IE2...IEn



(where  $n$  is the total number of optical emitters), and records the intensities of radiation received by the optical receiver 274 from each of the optical emitters 273 as received intensities  $IR_1; IR_2 \dots IR_n$ .

5 By comparing the emitted radiation intensities  $IE_1; IE_2 \dots IE_n$  with the received radiation intensities  $IR_1; IR_2 \dots IR_n$ , the controller 278 calculates a series of intensity ratios  $IE_1:IR_1; IE_2:IR_2 \dots IE_n:IR_n$ , which are then used to determine the level of the liquid inside the container. At the most basic level, if the intensity ratio of  $IE_1:IR_1$  is the same as  $IE_2:IR_2$ , given the optical emitters 273 are equidistant from the optical receiver 274,  
10 this indicates that the level of the liquid inside the container is parallel to the top of the bottle, as shown in Figure 27. In contrast, if these two intensity ratios are different, this indicates that the liquid level is at a different angle, such as that shown in Figure 28.

To accurately determine the level and the quantity of liquid inside the container 275, the  
15 controller 278 processes the recorded intensity ratios using a database located in the memory 280. The database contains an individual record for each container which is operable to connect with the device 270. Each record from the database contains a look-up table of information, which contains expected intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) for the container 275 when filled at different orientations, and with different quantities of  
20 liquid.

By comparing the information from the look-up table with the recorded intensity ratios, the controller 278 calculates the level and quantity of liquid inside the container 275 and stores this information in the memory 280.

25

In situations where a container 275 to the device 270 contains no stored record in the database, the sensing assembly 272 can be used in a calibration mode to create a new record. In the calibration mode, the sensing assembly 272 is operated as the container is filled from empty, and as it is positioned at different orientations. At each point during  
30 the calibration mode, the controller 278 calculates the recorded intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) and stores them in the record relating to the container 275. For each set of recorded intensity ratios, the user includes information in the record relating to the orientation and fill level of liquid inside of the container 275.

To improve the accuracy of the results obtained by the device 270 during its use, the controller 278 when recording each intensity ratio also records a parameter from the accelerometer 281 relating to the acceleration experienced by the device 270. For each recorded acceleration parameter, the controller 278 determines whether the parameter  
5 278 exceeds a predetermined threshold acceleration parameter stored in the memory 280. The predetermined threshold is indicative of an excessive acceleration, which causes sloshing of liquid inside the container 275 connected to the device 270. In the event of a recorded acceleration parameter exceeding the predetermined threshold acceleration parameter, the controller 278 flags the recorded intensity ratios associated with the  
10 recorded acceleration parameter as being unreliable (due to sloshing).

Even without the use of the accelerometer 281, the controller 278 is nonetheless operable to determine whether a set of recorded intensity ratios occur during a period of excess acceleration. In this regard, for each set of intensity ratios recorded at a given  
15 time, the controller 278 checks whether any of these intensity ratios is of a predetermined order of magnitude different than the remaining recorded intensity ratios from the set. In the event that the controller 278 determines that this is the case, this indicates that the liquid inside the container has 'sloshed' as a result of the excess acceleration, as shown in Figure 29. In this event, the controller 278 flags the set of recorded intensity ratios as  
20 being unreliable.

It will be appreciated that instead of recording the relative intensities of radiation emitted by the optical emitters 273 with the radiation received by the optical emitter 274, the controller 278 could instead record the time taken for radiation emitted by each of the  
25 optical emitters 273 to be received by the optical receiver 274. In this arrangement, the look up table would instead contain time periods as opposed to intensity ratios.

In terms of the applications for the device 270, it will be appreciated that the device can be used in a wide variety of applications. One possible application is the use of the device  
30 270 to determine the level of liquid located within a container 275, such as a baby bottle, used as part of a breast pump assembly. In this arrangement, the device 270 is associated with a breast pump 301 which assists with the expression of milk from a breast. The breast pump may be located in the housing 271 of the device 270 as shown in Figure 30, or it may be realisably connected to the housing 271.

Either way, the device 270 would be connectable to the container 275 such that milk expressed by the breast pump can pass from the pump via a channel 302 into the container 275.

5

The breast pump may be any type of breast pump system including any shapes of milk container or bottle and may comprise a pump module for pumping milk from a breast. The pump module being contained within the housing may comprise: a coupling, a container attachable to the housing via the coupling to receive milk from the pump, a  
10 sensing assembly within the housing and comprising at least one optical emitter operable to emit optical radiation towards the surface of the body of milk held in the container when the housing is connected to the container, an optical receiver for receiving the reflected radiation from the surface of the milk, and a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the  
15 level of the milk inside the container based on the reflected radiation received by the optical receiver.

By determining the level of milk inside the container based on reflected radiation from the surface of the milk in the container, there is no need to monitor the individual  
20 droplets of milk entering the container, such that the sensing assembly can avoid errors associated with measuring these droplets. For example, because we take multiple reflection-based measurements once the container is filled, we can generate an average measurement that that is more accurate than a single measurement. But with systems that rely in counting individual droplets, that is not possible – further, systemic errors  
25 (e.g. not counting droplets below a certain size) will accumulate over time and render the overall results unreliable. Furthermore, by not needing to measure these droplets, the sensing assembly from the breast pump need not always be on during the pumping process, which saves power.

30 When at least two optical emitters are used, the sensing assembly from the breast pump may determine the level of milk inside the container more accurately and irrespective of the orientation of the liquid level inside the container.

Each optical emitter may be equidistant from the optical receiver in order for the

controller to easily calculate the level of the milk inside the container based on the reflected radiation originating from each optical emitter. The signals from the optical receiver preferably comprise information relating to the intensity of the radiation received by the optical receiver.

5

Each optical emitter may be operable to emit radiation at a different wavelength, or at a different time, than the other optical emitters. In this way, the controller can more easily process the signals from the optical receiver, and more easily distinguish between the radiation emitted by each of the optical emitters.

10

The optical emitter may emit radiation in the visible range of wavelengths. Alternatively, it may be UV or IR light. The emitted wavelength may be for example between 10nm and 1mm.

15

The sensing assembly may also comprise at least one accelerometer electrically connected to the controller. The controller may be configured to record an accelerometer parameter from the accelerometer and determine whether the accelerometer parameter exceeds a predetermined threshold. The predetermined threshold may be indicative of an excessive acceleration, which might cause sloshing of milk inside any container connected to the breast pump.

20

Another application for the device 270 is as a collar for detecting the level/quantity of liquid in a container 275, such as a baby bottle, via its lid 310. An example of the device 270 being used as such a collar is shown in Figure 31. In this arrangement, the device 270 is located between the container 275 and the lid 310, and comprises a first end 311 having a first coupling 312 for attaching the collar to the lid 310. The device comprises a second end 313 having a second coupling 314 for attaching the device 270 to the container 275. The second coupling may be a screw thread, shown in Figure 31, on the inside surface of the container 275. In this way, the distinctive bottom inside surface can be used by the sensing assembly 272 to more easily calibrate itself to the container 275 on which the distinctive bottom inside surface is located. The distinctive bottom may also be used to help identify which container 275 the device is connected to, and thus which record should be used from the database when the device 270 is used.

25  
30

To further improve the accuracy of the sensing assembly 272, the controller 278 may also be configured to use the recorded information from the accelerometer 281, in situations where the record acceleration is below the predetermined threshold acceleration parameter, to calculate a more accurate liquid level and/or quantity of liquid located  
5 inside the container which is compensated for acceleration.

In one particular arrangement, the controller 278 may poll the accelerometer 281 prior to each operation of the sensing assembly 272 to verify that the device 270 is not currently undergoing excessive acceleration. In the event of the controller 278 determining  
10 excessive acceleration in the device 270, the controller 278 would continually re-poll the accelerometer, and not operate the sensing assembly 272, until the parameter from the accelerometer is determined as being below the predetermined threshold acceleration parameter stored in the memory 280.

15 It will also be appreciated that for each container record stored in the database, the container record may comprise a plurality of look up tables, wherein each look up table is associated with a particular liquid used in the container, and wherein each look up table contains its own set of intensity ratios. In this way, the device 270 can more accurately determine the level/quantity of different liquids used in a particular container 275.

20 As described herein, the sensing assembly 272 has been described as having a plurality of optical emitters 273. It will be appreciated however that the sensing assembly could operate using a single optical emitter 273 and plurality of optical receivers 274. In this arrangement, each record from the database would contain a plurality of ratios relating to  
25 the emitted radiation from the optical emitter 273 as received by each of the optical receivers 274. In use of the device 270, the controller 278 would then similarly record the emitted radiation from the optical emitter 273 as received by each of the optical receivers 274. In an alternate arrangement, there may be provided a plurality of optical emitters 273 and a plurality of optical receivers 274, wherein each optical emitter 273 is associated  
30 with a respective optical receiver 274. In its simplest arrangement, the sensing assembly 272 may comprise a single optical emitter 273 and a single optical receiver 274.

In certain configurations, the optical emitters 273 may together emit radiation having the same wavelength. In other configurations, the optical emitters 273 may each emit

radiation having a different wavelength. In this latter configuration, the optical receiver 274 would then be able to determine which optical emitter 273 is associated with any given received radiation, based on the wavelength of the received radiation.

- 5 The optical emitters 273 may also each emit radiation at different times, such to allow the controller 278 to more easily process the signals from the optical receiver 274, and more easily distinguish between the radiation emitted by each of the optical emitters 273.

10 In relation to the electrical connection between the controller 278 and the sensing assembly 272, it will be appreciated this electrical connection may be either a wired/wireless connection as required.

Although not shown in the Figures, the device 270 herein described is preferably powered by a battery or some other power source located in the device 270. In other  
15 embodiments, the device 270 may be powered using mains electricity.

In one configuration, it is also envisaged that rather than the controller 278 comparing the information from the look-up table with the recorded intensity ratios to calculate the level and quantity of liquid inside the container 275, the controller 278 could instead  
20 process the recorded intensity ratios through a liquid-level equation stored in the memory 280. In this configuration, the liquid-level equation could be a generalised equation covering a family of different containers, or could be an equation specific to a container having a given shape and/or type of liquid inside.

25 It will also be appreciated that in some applications of the device 270, the device could be used to detect the level of a solid, as opposed to a liquid, in a container. As used herein, the terms 'optical emitter' and 'optical receiver' are intended to cover sensors which can emit radiation in or close to the optical wavelength. Any type of radiation at or close to the optical wavelength is suitable provided that it does not have any harmful  
30 effects. The exact wavelength is not important in the context of the invention. Such sensors thus include those which can emit visible radiation (such as radiation having wavelengths in the region of 400nm-700nm), and/or those which can emit IR radiation (such as radiation having wavelengths in the region of 700nm-1mm and/or those which can emit UV radiation (such as radiation having wavelengths in the region of 10nm to

400nm).

Existing prior art for such a sensor module is the apparatus disclosed in RU2441367. In this apparatus, the container is an industrially sized milk tank, which only includes a single laser mounted at the top of the tank. Whilst this apparatus is suited for large-sized containers, which do not move in use, the apparatus is less-suited for applications where the container moves in use, or where the liquid level inside the container is non perpendicular to the laser beam shone into the container. In contrast, the sensor module described above can be used in a variety of different applications, is conveniently located within a housing, and which by virtue of it having at least two optical emitters, can determine the level of liquid even inside containers of irregular shapes, and which can determine the level of liquid inside a container irrespective of the orientation of the liquid level inside the container.

Further to the embodiments of the fluid measurement system in different contexts, it can be appreciated that different functions entirely may be possible using the same component structure. For example, it is known that certain molecules within breast milk absorb specific wavelengths of light at characteristic propensities. Whilst the proposed system uses multiplexed IREDs at the same wavelengths to perform proximity measurements, the same array of IREDs may instead be used to emit several different wavelengths of light and determine their absorption upon reflection. If appropriately calibrated, the system may be able to report on the presence or concentration of specific compounds in the expressed milk, such as fat, lactose or protein content.

In addition to this embodiment, it is feasible that the system might be applied to monitor the change in volume of any other container of liquid, given there is sufficient reflection of IR off its surface. These embodiments might include for example: liquid vessel measurement such as for protein shakes, cement or paint, or volume measurements within a sealed beer keg.

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## SECTION C: BRA CLIP

This section describes a bra clip that forms an accessory to the Elvie™ pump.

5

It relates to a system allowing a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast pump. As such, the user does not need a specialised adjustable bra; instead the present system works with all conventional maternity bras. The user also does  
10 not have to purchase any larger bras to wear while pumping.

As shown in Figure 32, a typical maternity bra 320 comprises a support structure made up of shoulder straps 321 which support the bra 320 on the wearer's shoulders, and a bra band 322 for extending around a user's ribcage, comprising two wings 323 and a central  
15 panel or bridge 324. The straps 321 are typically provided with adjustment mechanisms 325 for varying the length of the straps 321 to fit the bra 320 to the wearer. At the outermost end of each wing, an attachment region 326 is provided. Typically, hooks 327 and loops 328 are provided for securing the bra 320 at the user's back. However, any other suitable attachment mechanism may be used. Alternatively, the attachment region  
20 326 may be provided at the front of the bra 320 in the bridge region 324, with a continuous wing 323 extending continuously around the wearer's back. Typically, a number of sets of loops 328 are provided to allow for variation in the tightness of the bra 320 on the wearer. While shown as having a separation in Figure 32, the wings 323 and bridge 324 may form a single continuous piece in certain designs. Likewise, while  
25 shown with a distinct separation in Figure 32, the shoulder straps 321 and the wings 323 may likewise form a single continuous piece.

The maternity bra 320 is further provided with two breast-supporting cups 329 attached to the support structure. The cups 329 define a cup size, which defines the difference in  
30 protrusion of the cups 329 from the band 322. The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting a 2 cm difference between the protrusion of the cups 329 from the band 322. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes



of S, M, L, XL, etc.

The cups 329 may be stitched to the bra band 321. At least one of the cups 329, is in detachable attachment with the corresponding strap 321. In particular, this is achieved at attachment point 330 where a hook 331 attached to the bra strap 321 engages with a clasp 331 attached to the cup 329. The hook 331 and the bra strap adjuster 325 are set such that in the closed position, the cup size of the bra 320 fits the wearer's breasts.

In Figure 32, the left cup 329 is shown attached to its attachment point 330, which the right cup 329 is unattached. In this manner, the wearer is able to detach the cup 329 to expose their breast for feeding or for breast pumping. Once this is completed, the cup 329 is reattached and the maternity bra 320 continues to function as a normal bra.

While in the depicted embodiments, a hook 331 is shown on the bra strap 321 and a clasp 332 is shown on the cup 329, it is appreciated that the provision of these may be reversed, or that alternative attachment mechanisms may be used.

A maternity bra therefore may comprise a support structure comprising shoulder straps and a bra band and a first and a second cup each attached to the support structure to provide a first cup size, at least one cup being at least partially detachable from the support structure at an attachment point.

In other embodiments, the detachable attachment point 330 may be provided at a different location, such as at the attachment between the bra band 322 and the cup 329. The mechanism for such an attachment point is the same as described above.

A clip has been designed such that it is configured to be attached to the support structure at a position away from the attachment point. This results in the original attachment point being usable, with the clip providing an alternative attachment point to give, in effect, an adjusted cup size.

Alternatively, the clip may also be attachable to the support structure at a plurality of non-discrete positions. This ensures essentially infinite adjustment of the clip position such that the perfect position for the user can be found.

The clip can also extend between an unextended and an extended state, and can attach to the support structure at the attachment point; the first cup size is providable when the at least partially detachable cup is attached to the clip when the clip is an unextended state; the second cup size is providable when the at least partially detachable cup is attached to the clip when the clip is in an extended state. An extendable clip like this allows quick switching between the two states in use.

Figure 33 depict a clip 335 according to the present invention, along with a clasp 332 shown in isolation from the bra cup 329 it is normally attached to. The clip comprises a first engagement mechanism and at least one second engagement mechanism(s). The clip is attachable in a releasable manner to the support structure at a first position via the first engagement mechanism and attachable in a releasable manner to one of the partially detachable cups via the second engagement mechanism to provide a second cup size different to the first cup size. The clip 335 is provided with a material pathway 336 which receives a portion of the bra strap 321. In the particular embodiment of these Figures, the clip 335 is substantially U-shaped, with a narrowing profile towards its open end. However, it is appreciated that any other suitable shape with a material pathway may be used, such as an S-shape or E-shape. The clip 335 is designed to be attached to the bra strap 321 in a releasable manner, with the slot 336 acting as a support engaging mechanism. The releasable manner means that the clip 335 may be simply removed from the bra 320 without causing any damage to the functioning of the bra 320. To enhance the ease of attachment, the clip 335 may be provided with outwardly extending wings 204 which help direct the bra strap 321 into the clip 335. The clip 335 is further provided with a hook 220 acting as a cup engaging mechanism which can engage with the clasp 332.

Figure 33 (c) shows the clip 335 being attached to a bra strap 321 in order to provide a second attachment point 337 for the clasp 332 to attach to, and hence to provide a second cup size for the bra 320. In this particular embodiment, the clip 335 is attached in a portion of strap 321A below the original attachment point 330 and hence the second attachment point 337 is likewise below the original attachment point. This results in a second cup size larger than the first cup size. In preferred embodiments, as shown in these Figures, the clip 335 engages with the support structure in a direction transverse to

the direction in which it engages with the cup.

Figure 33 (d) and (e) show how a wearer is able to move between the first and second cup sizes. In 33(d), the cup 329 is attached at the first attachment point 330 to provide a first cup size. The wearer then disengages the clasp 332 from the hook 331 at the hook 338 at the second engagement point 239. In this manner, the wearer is easily able to transition between the two cup sizes.

Figures 34 and 35 show an alternative design for a clip 340. This clip 340 is substantially “E-shaped”, with a back portion 341 and first, second and third prongs 342A, 342B, 342C extending transverse from this back portion 341. The three prongs 342A, 342B, 342C are spaced apart along the length of the back portion 341. The first and third prongs 342A, 342C are provided with attachment clips 343A, 343B.

These attachment clips 343A, 343B can engage with the clasp 332 of a bra to provide the second cup size. Depending upon the orientation of the clip 300, one or the other of the attachment clips 343A, 343B will be used to attach the clasp 332 of the bra. By providing these clips 343A, 343B on both of the first and the third prongs 342A, 342C the clip is easily reversible so it can be used on either side of the bra. Preferably the clip 340 is also symmetrical, to aid the reversibility of the clip 340.

Figure 35 shows the clip 340 attached to a bra. As can be seen, the first and third prongs 342A, 342C extend on the front side of the bra strap, with the second prong 342B extending on the rear side of the bra strap. In this manner, the clip 340 is attached to the strap. In preferable embodiments, a grip-enhancing member 344 such as a number of projections and/or roughened patches can be provided on the second prong 342B in order to strengthen this grip.

In alternative embodiments, the attachment clip could be provided on the second, centremost prong 342B. In such an arrangement, the centremost prong 342B would be on the outside of the bra, with the first and third prongs 342A, 342C on the inside.

The provision of the attachable clip allows maternity bras already owned by the wearer to be quickly transformed into bras with quick switchable double cup size options.

This allows the use of integrated wearable breast pumps which increase the user's required cup size. This allows more design freedom for the breast pump in terms of size and shape, while still allowing the user to discretely pump with the pump held within their bra. By allowing conversion of the user's existing maternity bras, they are not forced to purchase specially designed bras to wear with the pump. The bra is hence normally at the first engagement point 330 when the breast pump device is not being used. As shown in Figure 33, the clasp 332 is then engaged by the user to discretely switch between the two configurations, and the user then inserts the pump without any complex adjustment or removal of clothing.

Preferably, the clip will be relatively unobtrusive in size and shape and hence can be left in place when the bra is first put on and used when necessary. To this end, the clip is preferably machine washable without significant damage or degradation.

In some embodiments, the clip may be switchable between positions for engaging with each cup so that a single clip may be used on either side of the bra. To achieve this, the clip is preferably reversible. This may provide the user with a visual indication of which breast has produced milk most recently so switching can take place.

In a preferred embodiment, the first engagement mechanism engages with the support structure in a first direction and the second engagement mechanism engages with the cup in a second direction transverse to the first direction. This increases ease of attachment as with this structure the sideways engagement of the clip to the support structure ensures that the second attachment mechanism is correctly orientated for the cup.

The second engagement mechanism may be one or more of a hook or a snap or a clip. This ensures easy interfacing with the traditional hook and clasp systems already provided on maternity bras.

Preferably the clip further comprises two distinct second engagement mechanisms which can be used interchangeably dependent upon the orientation of the clip. This makes the clip easier to use as it can be quickly switched between each bra strap, and the user does not have to worry which way up to put the clip on.

Preferably, the clip comprises a material pathway with an opening for receiving a portion of the support structure as the first engagement mechanism for securing the clip to the bra. This ensures a quick and simple method for attaching the clip to the bra. In particular, the clip may substantially U-shaped, and the material pathway is between the arms of the U.

Preferably, the clip comprises three prongs extending from a central support, the three prongs arranged as a central prong and two outer prongs so as to receive the support structure on one side of the central prong and on the opposite side of each respective outer prong, at least one prong being provided with the second engagement mechanism. This ensures a strong attachment to the bra and a simple design.

Preferably, both outer prongs are each provided with a respective second engagement mechanism. This ensures that the clip is reversible for easier attachment to the bra.

A method of adjusting the cup size of a maternity bra is provided according to the present invention, comprising: providing a maternity bra comprising: a support structure comprising shoulder straps and a bra band; and a first and second cup each attached to the support structure to provide a first cup size, the at least one cup being detachable from the support structure at an attachment point, providing a clip comprising first and section engagement mechanisms, attaching the first engagement mechanism of the clip in a releasable manner to a first position of the support structure of the maternity bra, attaching one of the detachable cup to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size.

This clip and method allow a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast pump.

Preferably, the method further comprises the step of inserting a breast pump into the detachable cup. The adjustment of the size of the bra allows the bra to support the breast pump against the user's breast for comfort and ease.

Preferably, the method further comprises the steps of: detaching the first engagement mechanism of the clip from the first position support structure of the maternity bra; attaching the first engagement mechanism of the clip in a releasable manner to a second position of the support structure of the maternity bra; and attaching the other of the detachable cups to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size. This allows the user to use a single clip on either of the cups.

An alternative embodiment may be provided, with an extendable clip 360 as shown in Figure 36. In such an embodiment the clip is attached to the hook 331 on the strap 321 in a releasable manner, with the clasp 332 attached to an expandable portion of the clip. The clip is then able to expand between an unexpanded state where the clasp 332 is held in substantially the same position as the first attachment point 330 to provide the first cup size, and an expanded state, where the clasp 332 is held in a second position away from the first attachment point 330 to provide the second cup size.

For example, an elongate clip with first and second opposite ends may be provided. A first attachment point for attaching to the hook 331 is provided at the first end, and a second attachment point for attaching to the clasp 332 is provided at the second end. The elongate clip is hinged between the two ends, such that the clip can be folded between an elongate configuration to a closed configuration where the second end touches the first end. A clasp can be provided on the clip to hold the second end in this closed configuration. Thus, in the closed position the clasp 332 is held in substantially the same location as the first attachment point 330 to provide the first cup size, and in the open position the clasp is held away from the first attachment point 330 to provide the second cup size.

Other extendable clip embodiments are also possible, for example sliding clips or elastic clips.

Additional embodiments of a maternity bra adjuster are provided in Figures 37 and 38. The alternative proposed solution is a small adapter device, which comprises a first portion 370 including a clasp 373 and a second portion 372 including a hook 374, in which the first and second portions are separated by a small distance 371 in order to

provide two different adjustable sizes. The first portion includes a clasp 373 that is designed to attach to the hook on the bra strap 321. It may also include a top hook 375 positioned underneath the clasp, and a clip 376 on the rear side. The second portion includes a bottom hook 372.

5

The clasp 332 that is present on the cup 329 of the maternity bra, may then either engage with the top hook (321) to provide a first cup size, and engage with the bottom hook (332) to provide a second cup size that is different from the first cup size, as illustrated in Figure 39. The user may then discretely switch between a non pumping position, provided by the first cup size, and a second pumping position without any complex adjustment or removal of clothing needed, while using a wearable breast pump system (100).

10

The first portion and second portion may be made of plastic and may be separated by a stretchy material such as elastic or elastomeric material. The first portion may also include a clip on the rear side, the purpose of which is to allow the user to leave the clip attached to the bra for an extended time period.

15

## Section D: Use of Piezo Pump in Wearables

As described in Section A, the breast pump system includes a piezo air pump, resulting in a fully wearable system that delivers a quiet, comfortable and discreet operation in normal use. This section gives further information on the piezo air pump.

In comparison with other pumps of comparable strength, piezo pumps are smaller, lighter and quieter. In operation, the Elvie breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise; tests indicate that it makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.

Piezo pumps also have lower current draw, allowing for increased battery life. A piezo pump is therefore ideally suited for wearable devices with its low noise, high strength and compact size. Further, as shown in the breast pump system of Figures 7 and 8, more than one piezo pump may be used.

Whilst a breast pump system is largely described in previous sections, the use of piezo mounted either in series or in parallel can also be implemented in any medical wearable devices or any wearable device. The piezo pump may pump air as well as any liquid.

With reference to Figure 40, a diagram illustrating a configuration of two piezo pumps mounted in series is shown.

With reference to Figure 41, a diagram illustrating a configuration of two piezo pumps mounted in parallel is shown.

With reference to Figure 42, the air pressure generated as a function of time by two piezo pumps mounted in series and two piezo pumps mounted in parallel are compared. In this example, the parallel configuration produces higher flow rate and achieves -100mmHg negative air pressure faster than the series configuration. In comparison, the series configuration produces lower flow rate and takes slightly longer to reach 100mmHg. However, the parallel configuration cannot achieve as high as a vacuum as the series configuration and plateaus at -140mmHg. In comparison, the series



configuration is able to generate about -240mmHg.

A dual configuration is also implemented in which more than one piezo pump is configured such that they can easily switch between a parallel mode and a series mode.

5 This dual configuration would suit wearable devices that would need to achieve either lower or higher pressure faster.

Figure 43 shows a plot of the air pressure generated as a function of time by two piezo pumps mounted in a dual configuration. In this dual configuration, the piezo pumps first  
10 start with a parallel mode in order to benefit from faster flow rate, and then switch to a series mode (as indicated by the switch-over point) when stronger vacuums are required, enabling to save up to 500ms on cycle time with elastic loads.

Additionally, a piezo pump may be used in combination with a heat sink in order to  
15 efficiently manage the heat produced by the wearable pump. This configuration may be used to ensure that the wearable device can be worn comfortably. The heat sink or heat sinks are configured to ensure that the maximum temperature of any parts of the breast pump system that might come into contact with the skin (especially prolonged contact for greater than 1 minute) are no more than 48°C and preferably no more than 43°C.

20

The heat sink may store the heat produced by a piezo pump in order to help diverting the heat produced to another location. This not only ensures that the wearable system can be worn comfortably, but also increases the lifetime of a piezo pump.

Figure 44 shows a picture of a wearable breast pump housing including multiple piezo  
25 pumps (440). The breast pump system is wearable and the housing is shaped at least in part to fit inside a bra. By applying a voltage to the piezo pumps, the pressure provided by the pumps increase. The generation of higher pressure by the piezo pumps also means higher heat produced that needs to be managed. Each piezo pump is therefore connected to a heat sink (441), such as a thin sheet of copper. The heat sink has a long  
30 thermal path length that diverts the heat away from the piezo pump.

The use of a heat sink in combination with a piezo pump is particularly relevant when the wearable device is worn directly or near the body, and where the management of heat induced by the piezo pump is crucial.

5 A wearable device including a piezo pump may therefore include a thermal cut out, and may allow for excess heat to be diverted to a specific location. The heat sink may be connected to an air exhaust so that air warmed by the piezo pumps vents to the atmosphere. For example, the wearable system is a breast pump system and the heat sink stores heat, which can then be diverted to warm the breast shield of the breast pump  
10 system.

Use cases application include but are not limited to:

- Wound therapy;
- High degree burns;
- 15 • Sleep apnoea;
- Deep vein thrombosis;
- Sports injury.

**APPENDIX: SUMMARY OF KEY FEATURES**

In this section, we summarise the various features implemented in the Elvie™ pump system. We organize these features into six broad categories:

- 5    **A.      Elvie Breast Pump: General Usability Feature Cluster**
- B.      Elvie Piezo Air Pump Feature Cluster**
- C.      Elvie Milk Container Feature Cluster**
- D.      Elvie IR System Feature Cluster**
- E.      Elvie Bra Clip Feature Cluster**
- 10   **F.      Other Features, outside the breast pump context**

Drilling down, we now list the features for each category:

**A.      Elvie Breast Pump: General Usability Feature Cluster**

- 15    Feature 1      Elvie is wearable and includes only two parts that are removable from the pump main housing in normal use.
- Feature 2      Elvie is wearable and includes a clear breast shield giving an unobstructed view of the breast for easy nipple alignment.
- Feature 3      Elvie is wearable and includes a clear breast shield with nipple guides for easy breast shield sizing.
- 20    Feature 4      Elvie is wearable and includes a breast shield that audibly attaches to the housing.
- Feature 5      Elvie is wearable and includes a breast shield that attaches to the housing with a single push.
- 25    Feature 6      Elvie is wearable and not top heavy, to ensure comfort and reliable suction against the breast.
- Feature 7      Elvie is wearable and has a Night Mode for convenience.

- Feature 8 Elvie is wearable and includes a haptic or visual indicator showing when milk is flowing or not flowing well.
- Feature 9 Elvie is wearable and collects data to enable the mother to understand what variables (e.g. time of day, pump speed etc.) correlate to good milk-flow.
- 5 Feature 10 Elvie is wearable and collects data that can be exported to social media.
- Feature 11 Elvie is wearable and has a smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.
- Feature 12 A smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.
- 10 Feature 13 Elvie is wearable and includes a sensor to infer the amount of movement or tilt angle during normal use.
- Feature 14 Elvie includes a control to toggle between expressing milk from the left breast and the right breast.
- 15 Feature 15 Elvie includes a pressure sensor.
- Feature 16 Elvie includes a microcontroller to enable fine tuning between pre-set pressure profiles.
- Feature 17 Elvie enables a user to set the comfort level they are experiencing.
- 20 Feature 18 Elvie includes a microcontroller to dynamically and automatically alter pump operational parameters.
- Feature 19 Elvie automatically learns the optimal conditions for let-down.

#### **B. Elvie Piezo Air Pump Feature Cluster**

- 25 Feature 20 Elvie is wearable and has a piezo air-pump for quiet operation.
- Feature 21 Elvie has a piezo air-pump and self-sealing diaphragm
- Feature 22 Elvie uses more than one piezo air pump in series.

- Feature 23 Elvie is wearable and has a piezo air-pump, a breast shield and a diaphragm that fits directly onto the breast shield.
- Feature 24 Elvie is wearable and has a piezo air-pump for quiet operation and a re-useable, rigid milk container for convenience.
- 5 Feature 25 Elvie has a piezo-pump for quiet operation and is a connected device.
- Feature 26 Elvie uses a piezo in combination with a heat sink that manages the heat produced by the pump.
- Feature 27 Elvie is wearable and gently massages a mother's breast using small bladders inflated by air from its negative pressure air-pump.
- 10 Feature 28 Elvie is wearable and gently warms a mother's breast using small chambers inflated by warm air from its negative pressure air-pump.

**C. Elvie Milk Container Feature Cluster**

- 15 Feature 29 Elvie is wearable and includes a re-useable, rigid milk container that forms the lower part of the pump, to fit inside a bra comfortably.
- Feature 30 Elvie is wearable and includes a milk container that latches to the housing with a simple push to latch action.
- Feature 31 Elvie is wearable and includes a removable milk container with an integral milk pouring spout for convenience.
- 20 Feature 32 Elvie is wearable and includes a removable milk container below the milk flow path defined by a breast shield for fast and reliable milk collection.
- Feature 33 Elvie is wearable and includes a breast shield and removable milk container of optically clear, dishwasher safe plastic for ease of use and cleaning.
- 25 Feature 34 Elvie is wearable and includes various components that self-seal under negative air pressure, for convenience of assembly and disassembly.

Feature 35 Elvie is wearable and includes a spout at the front edge of the milk container for easy pouring.

Feature 36 Elvie is wearable and includes a milk container that is shaped with broad shoulders and that can be adapted as a drinking bottle that baby can easily hold.

5

#### **D. Elvie IR System Feature Cluster**

Feature 37 Elvie is wearable and includes a light-based system that measures the quantity of milk in the container for fast and reliable feedback.

10 Feature 38 The separate IR puck for liquid quantity measurement.

Feature 39 The separate IR puck combined with liquid tilt angle measurement.

#### **E. Bra Clip Feature**

Feature 40 Bra Adjuster.

15

#### **F. Other Features that can sit outside the breast pump context**

Feature 41 Wearable device using more than one piezo pump connected in series or in parallel.

Feature 42 Wearable medical device using a piezo pump and a heat sink attached together.

20

We define these features in terms of the device; methods or process steps which correspond to these features or implement the functional requirements of a feature are also covered.

25

We'll now explore each feature 1 – 41 in depth. Note that each feature can be combined with any other feature; any sub-features described as 'optional' can be combined with any other feature or sub-feature.

5 **A. Elvie Breast Pump: General Usability Feature Cluster**

**Feature 1 Elvie is wearable and includes only two parts that are removable from the pump main housing in normal use**

A wearable breast pump system including:

- 10 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) a breast shield;
- (c) a rigid or non-collapsible milk container;

and in which the breast pump system includes only two parts that are directly removable from the housing in normal use or normal dis-assembly: the breast shield and the rigid,  
15 non-collapsible milk container.

Optional:

- The only parts of the system that come into contact with milk in normal use are the breast shield and the milk container.
- Milk only flows through the breast shield and then directly into the milk  
20 container.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- 25 • The two removable parts are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and nipple tunnel shaped to receive a nipple.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings, in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- No other parts are removable from the breast shield, apart from the flexible diaphragm.
- The milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.
- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.



- No other parts are removable from the milk container, apart from the cap and the valve.
- All parts that are user-removable in normal use are attached to either the breast shield or the milk container.
- 5      • Audible or haptic feedback confirms the pump system is properly assembled for normal use with the milk container locked to the housing and the breast shield locked to the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from  
10      that breast.

**Feature 2      Elvie is wearable and includes a clear breast shield giving an unobstructed view of the breast for easy nipple alignment**

A wearable breast pump system including:

- 15      (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) and a breast shield including a substantially transparent nipple tunnel, shaped to receive a nipple, providing to the mother placing the breast shield onto her breast a clear and unobstructed view of the nipple when positioned inside the nipple tunnel, to  
20      facilitate correct nipple alignment.

Optional:

- The breast shield is configured to provide to the mother a clear and unobstructed view of the nipple when the breast shield is completely out, of or separated from, the housing.
- 25      • The breast shield is configured to provide to the mother a clear and unobstructed view of the nipple when the breast shield is partially out of, or partially separated from, the housing.
- Entire breast shield is substantially transparent.
- Breast shield is a one-piece item including a generally convex surface shaped to  
30      fit over a breast.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- A milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.

- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.

5

**Feature 3 Elvie is wearable and includes a clear breast shield with nipple guides for easy breast shield sizing**

A wearable breast pump system including:

10 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;

(b) and a breast shield including a substantially transparent nipple tunnel shaped to receive a nipple, the nipple tunnel including guide lines that define the correct spacing of the nipple from the side walls of the nipple tunnel.

Optional:

- 15
- The guide lines run generally parallel to the sides of the nipple placed within the nipple tunnel.
  - Breast shield is selected by the user from a set of different sizes of breast shield to give the correct spacing.
  - Breast shield is a one-piece item including a generally convex surface shaped to
- 20 fit over a breast.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
  - Breast shield is configured to be rotated smoothly around the nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at
- 25 the top of the breast.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
  - Breast shield latches into position against the housing.
  - Breast shield latches into position against the housing when spring plungers in
- 30 the housing locate into small indents in the breast shield.

- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 4 Elvie is wearable and includes a breast shield that audibly attaches to the housing.**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) and a breast shield that is attachable to the housing with a mechanism that latches with an audible click when the breast shield is slid on to or against the housing with sufficient force.

Optional:

- The breast shield is configured to slide onto or against the housing in a direction parallel to the long dimension of a nipple tunnel in the breast shield.

- Breast shield is removable from the housing with an audible click when the breast shield is pulled away from the housing with sufficient force.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast.
- 5      • Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around the nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- 10      • Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- 15      • Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when negative air pressure is applied to it by an air pump system in the housing, and (b) transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- 20      • The edge of the flexible diaphragm seals, self-seals, self-energising seals, or interference fit seals against the housing when the breast shield attaches to the housing.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- 25      • Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 30      • Nipple tunnel includes on its lower surface an opening through which expressed milk flows.

- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

5     **Feature 5     Elvie is wearable and includes a breast shield that attaches to the housing with a single push**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10   (b) and a breast shield configured to attach to the housing with a single, sliding push action.

Optional:

- The breast shield is configured to slide onto or against the housing in a direction parallel to the long dimension of a nipple tunnel in the breast shield.
- 15   • The single push action overcomes a latching resistance.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- 20   • Breast shield is configured to be rotated smoothly around a nipple inserted into a nipple tunnel in the breast shield to position a diaphragm housing portion of the breast shield at the top of the breast.
- Housing is configured to slide onto the breast shield when the breast shield has been placed onto a breast using guide members.
- 25   • Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.
- Breast shield includes or operates with a flexible diaphragm that (a) flexes when
- 30   negative air pressure is applied to it by an air pump system in the housing, and (b)

transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.

- The edge of the flexible diaphragm seals, self-seals, self-energising seals, or interference fit seals against the housing when the breast shield attaches to the housing.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel includes on its lower surface an opening through which expressed milk flows.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- A milk container attaches to a lower surface of the housing and forms the base of the breast pump system in use.
- The milk container mechanically or magnetically latches to the housing.
- The milk container is released by the user pressing a button on the housing.
- The milk container includes a removable cap and a removable valve that is seated on the lid.
- In normal use, the milk container is positioned entirely within a bra.

**Feature 6      Elvie is wearable and not top heavy, to ensure comfort and reliable suction against the breast**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism

(b) and a breast shield;

(c) a milk container;

and in which the centre of gravity of the pump system is, when the milk container is empty, substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through a nipple tunnel or filling point on a breast shield, so  
5 that the device is not top-heavy for a woman using the pump.

Optional:

- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- 10 • In which the centre of gravity only moves lower during use as the milk container gradually receives milk, which increases the stability of the pump inside the bra.
- In which milk only passes downwards when moving to the milk container, passing through the nipple tunnel and then through an opening in the lower surface of the nipple tunnel directly into the milk container, or components that  
15 are attached to the milk container.
- System is configured so that its centre of gravity is no more than 60mm up from the base of the milk container also below the top of the user's bra cup.
- In which the pumping mechanism and the power supply for that mechanism are positioned within the housing to provide a sufficiently low centre of gravity.
- 20 • In which the pumping mechanism is one or more piezo air pumps, and the low weight of the piezo air pumps enables the centre of gravity to be substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through the nipple tunnel or filling point on the breast shield.
- In which the pumping mechanism is one or more piezo air pumps, and the small  
25 size of the piezo air pumps enables the components in the housing to be arranged so that the centre of gravity is substantially at or below (i) the half-way height line of the housing or (ii) the horizontal line that passes through the nipple tunnel or filling point on the breast shield.
- In which the pumping mechanism is one or more piezo air pumps, and the low  
30 weight of the battery or batteries needed to power that piezo air pumps enables the centre of gravity to be substantially at or below (i) the half-way height line of



the housing or (ii) the horizontal line that passes through the nipple tunnel or filling point on the breast shield.

- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

#### **Feature 7 Elvie is wearable and has a Night Mode for convenience**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- 10 (b) an illuminated control panel;
- (c) a control system that reduces or adjusts the level or colour of illumination of the control panel at night or when stipulated by the user.

Optional:

- 15 • The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Control system is implemented in hardware in the pump itself using a 'night mode' button.
- Control system is implemented in software within a connected device app running on the user's smartphone.
- 20 • Control system is linked to the illumination level on a connected device app., so that when the connected app is in 'night mode', the illuminated control panel is also in 'night mode', with a lower level of illumination, and when the illuminated control panel on the housing is in 'night mode', then the connected app is also in 'night mode'.
- 25 • Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast. The pumping mechanism is one or more piezo air pumps, selected for quiet operation.

**Feature 8 Elvie is wearable and includes a haptic or visual indicator showing when milk is flowing or not flowing well**

A wearable breast pump system including:

- 5 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
  - (b) a milk container that is configured to be concealed within a bra and is hence not visible to the mother in normal use;
  - (c) a visual and/or haptic indicator that indicates whether milk is flowing or not flowing into the milk container.
- 10 Optional:
- A haptic and/or visual indicator indicates if the pump is operating correctly to pump milk, based on whether the quantity and/or the height of the liquid in the container above its base is increasing above a threshold rate of increase
  - 15 • The visual indicator is a row of LEDs that changes appearance as the quantity of liquid increases.
  - The haptic and/or visual indicator provides an indication of an estimation of the flow rate.
  - The visual indicator provides a colour-coded indication of an estimation of the flow rate.
  - 20 • The visual indicator provides an indication of how much of the container has been filled.
  - The visual indicator is part of a user interface in a connected, companion application, running on a smartphone or other personal device, such as a smart watch or smart ring.
  - 25 • The haptic indicator is part of a user interface in a connected, companion application, running on a smartphone or other personal device, such as a smart watch or smart ring.
  - A sub-system measures or infers the quantity and/or the height of the liquid in the container.
  - 30 • The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect

light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.

- Sub-system includes or communicates with an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- A sub-system measures or infers the angle the top surface of the liquid in the container makes with respect to a baseline, such as the horizontal.
- A haptic and/or visual indicator indicates if the amount of milk in the milk container has reached a preset quantity or level.
- A haptic and/or visual indicator indicates if there is too much movement of the breast pump system for viable operation.
- Milk container is attached to the lower part of the housing and forms the base of the breast pump system.
- Milk container is made of transparent material.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 9 Elvie is wearable and collects data to enable the mother to understand what variables (e.g. time of day, pump speed etc.) correlate to good milk-flow**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- (b) a milk container;
- (c) a measurement sub-system that measures or infers milk flow into the milk container;

and in which the measurement sub-system provides data to a data analysis system that determines metrics that correlate with user-defined requirements for milk-flow rate or milk expression.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- User-defined requirement is to enhance or increase milk-flow.
- 5      • User-defined requirement is to reduce milk-flow.
- The data analysis system analyses data such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- 10      • The data analysis system determines metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level, peak negative air pressure or vacuum level, pump cycle time or frequency, changing profile of pump speed over a single pumping session time of day.
- 15      • The data analysis system determines metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely matches.
- 20      • Data analysis system is local to the breast pump system, or runs on a connected device, such as a smartphone, or is on a remote server or is on the cloud, or is any combination of these.
- measurement sub-system measures or infers the quantity and/or the height of the liquid in the container above its base.
- 25      • Measurement sub-system measures or infers angle the top surface of the liquid in the container makes with respect to a baseline, such as the horizontal.
- Data analysis system gives recommended metrics for improving milk flow
- Data analysis system gives recommended metrics for weaning.
- 30      • Data analysis system gives recommended metrics for increasing milk supply (e.g. power pumping).
- Data analysis system gives recommended metrics if an optimal session start time or a complete session has been missed.

- Data analysis system leads to automatic setting of metrics for the pumping mechanism, such as pump speed, length of a single pumping session, vacuum level, cycle times, changing profile of pump speed over a single pumping session.
- 5      • Data analysis system enables sharing across large numbers of connected devices or apps information that in turn optimizes the milk pumping or milk weaning efficacy of the breast pump.
- Metrics include the specific usage of the connected device by a woman while using the pump (for example by the detection of vision and/or audio cues).
- 10      • The measurement sub-system measures or infers the quantity and/or the height of the liquid in the container.
- The measurement sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.
- 15      • The measurement sub-system includes or communicates with an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the measurement sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- 20      • Milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

25

**Feature 10      Elvie is wearable and collects data that can be exported to social media.**

A breast pump system including:

- (a) a housing including a pumping mechanism;
- 30      (b) a milk container;

(c) a data sub-system that collects and provides data to a connected device or remote application or remote server;

(d) and in which the collected data, in whole or in part, is used by a data analysis system that provides inputs to a social media or community function or platform.

5 Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- The data analysis system analyses metrics such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over  
10 one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- The data analysis system analyses metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level, peak negative air pressure or vacuum level, pump cycle time or frequency,  
15 changing profile of pump speed over a single pumping session time of day.
- The data analysis system analyses metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely  
20 matches.
- Data analysis system is local to the breast pump system, or runs on a connected device, such as a smartphone, or is on a remote server or is on the cloud, or is any combination of these.
- The social media or community function or platform organizes the collected data  
25 into different profiles.
- The social media or community function or platform enables a user to select a matching profile from a set of potential profiles.
- each profile is associated with a specific kind of milk expression profile, and provides information or advice that is specifically relevant to each milk  
30 expression profile.
- Information or advice includes advice on how to increase milk expression by varying parameters, such as time of milk expression, frequency of a milk

expression session, pump speed, length of a single pumping session, vacuum level, cycle times, changing profile of pump speed over a single pumping session and any other parameter that can be varied by a mother to help her achieve her milk expression goals.

- 5       • The application is connected to other applications residing on the connected device, such as a fitness app.
- The collected data includes data received from other connected apps.
- The collected data is anonymised before it is shared.
- 10     • The sub-system includes a wi-fi connectivity component for direct connectivity to a remote server.
- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from  
15     that breast.

**Feature 11 Elvie is wearable and has a smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh**

A breast pump system including a pumping mechanism and a milk container and  
20     including:

- (a)     a housing including the pumping mechanism;
- (b)     a milk container;
- (c)     and in which the milk container or any associated part, such as a lid, includes a memory or tag that is automatically programmed to store the time and/or date it was  
25     filled with milk.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Memory or tag is programmed to store the quantity of milk in the milk container.
- 30     • Memory or tag stores the milk expiry date.

- Memory or tag stores a record of the temperature of the milk or the ambient temperature around the milk, and calculates an expiry date using that temperature record.
- System includes a clock and writes the time and/or date the milk container was filled with milk to the memory or tag on the milk container.
- Clock is in the housing.
- Clock is in the milk container.
- Milk container includes a display that shows the time and/or date it was filled with milk.
- Milk container includes a display that shows the quantity of milk that it was last filled with milk.
- Milk container includes a display that shows whether the left or right breast was used to fill the milk container.
- Memory or tag is connected to a data communications sub-system.
- Memory or tag is a remotely readable memory or tag, such as a NFC tag, enabling a user to scan the milk container with a reader device, such as a smartphone, and have the time and/or date that container was filled with milk, displayed on the reader device.
- Reader device shows the time and/or date a specific milk container was filled with milk.
- Reader device shows the quantity of milk that a specific milk container was last filled with.
- Reader device shows the time and/or date and/or quantity that each of several different milk containers were filled with.
- Reader device shows whether the left or right breast was used to fill the milk contained in a specific milk container.
- A sub-system measures or infers milk flow into the milk container.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.



- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/Tr the height of the liquid in the container.
- The sub-system is in the housing.
- 5 • Milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.
- Pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk form that breast.

10

**Feature 12 A smart bottle that stores the time and/or date of pumping to ensure the milk is used when fresh.**

A smart bottle or container that includes or is associated with a memory or a tag that is programmed to store the date and time it is filled using data from a pump or a connected  
15 device, such as a smartphone.

Optional:

- The container includes wireless connectivity and connects to a companion app.
- The memory or tag includes an NFC chip and is read using a NFC reader.
- The memory or tag stores also an expiry date.
- 20 • Memory or tag stores a record of the temperature of the milk or the ambient temperature around the milk, and calculates an expiry date using that temperature record.
- The memory or tag stores also the quantity of milk stored.
- System includes a clock and writes the time and/or date the milk container was  
25 filled with milk to the memory or tag on the milk container.
- Clock is in the housing.
- Clock is in the container.
- Milk container includes a display that shows the time and/or date it was filled with milk.
- 30 • Milk container includes a display that shows the quantity of milk that it was last filled with milk.

- Milk container includes a display that shows whether the left or right breast was used to fill the milk contained.
- Milk container includes a display that shows the expiry date.
- memory or tag is connected to a data communications sub-system.
- 5 • Memory or tag is a remotely readable memory or tag, such as a NFC tag, enabling a user to scan the milk container with a reader device, such as a smartphone.
- Reader device shows the time and/or date a specific milk container was filled with milk.
- Reader device shows the quantity of milk that a specific milk container was last  
10 filled with.
- Reader device shows the time and/or date and/or quantity that each of several different containers were filled with.
- Reader device shows whether the left or right breast was used to fill the milk contained in a specific milk container.
- 15 • Reader device shows the expiry date.
- Container includes wireless connectivity and connects to a companion application.
- An application tracks status of one or more smart containers and enables a user to select an appropriate smart container for a feeding session.
- 20 • The pump is wearable.
- The pump is in a housing shaped to fit inside a bra and the container is a milk container that is connected to the housing and is positioned to form the base of the housing.
- Container is used for liquids other than milk.

25

**Feature 13 Elvie is wearable and includes a sensor to infer the amount of movement or tilt angle during normal use.**

A breast pump system including:

- (a) a housing;
- 30 (b) a milk container;

(c) the housing including a sensor, such as an accelerometer, that measures or determines the movement and/or tilt angle of the housing, during a pumping session and automatically affects or adjusts the operation of the system depending on the output of the sensor.

5 Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- If the tilt angle of the housing exceeds a threshold, then the system automatically affects the operation of the system by warning or alerting the mother of a potential imminent spillage (e.g. from milk flowing back out of a breast shield) using an audio, or visual or haptic alert, or a combination of audio, haptic and visual alerts.
- If the tilt angle of the housing exceeds a threshold, then the system automatically adjusts the operation of the system by stopping the pump to prevent spillage.
- When the tilt angle of the housing reduces below the threshold, the system automatically adjusts the operation of the system by causing pumping to resume automatically.
- If the tilt angle of the housing exceeds a threshold, then the system automatically affects the operation of the system by providing the mother with an alert to change position.
- The container includes an optically clear region.
- There are one or more light emitters and detectors positioned in the base of the housing, the light emitters and receivers operating as part of a sub-system that measures or infers the tilt angle of the milk in the container.
- The sub-system measures the quantity of liquid in the milk container and also takes the measured tilt angle of the housing into account.
- If the tilt angle is above a certain threshold, the system ignores the quantity of liquid measured.
- The sub-system derives or infers the mother's activity, such as walking, standing or lying activities, from the sensor.
- The milk container is a re-useable milk container that when connected to the housing is positioned to form the base of the housing.

- Sub-system stores a time-stamped record of movement and/or tilt angles of the housing in association with milk flow data.
- System includes a breast shield that attaches to the housing.
- System includes a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 14 Elvie includes a control to toggle between recording whether milk is being expressed from the left breast and the right breast.**

10 A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a control interface that the user can select to indicate or record if milk is being expressed from the left or the right breast.

Optional:

- 15 • Control interface is a physical interface on the housing.
- Control interface is a single button on the housing.
- Control interface is from an application running on a device, such as a smartphone or smart ring.
- Visual indicators on the housing indicate whether the breast pump system is being set up the left or the right breast.
- 20 • The visual indicator for the left breast is on the right-hand side of the housing, when viewed from the front; and the visual indicator for the right breast is on the left-hand side of the housing, when viewed from the front.
- The housing includes a button labeled to indicate the left breast and a button labeled to indicate the right breast, that are respectively illuminated to indicate from which breast the milk is being expressed.
- 25 • Breast pump system is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

30

**Feature 15 Elvie includes a pressure sensor.**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) an air pressure sensor configured to measure the negative pressure delivered by the negative air-pressure mechanism and (iii) a measurement sub-system that

5 measures or infers milk flow or milk volume.

Optional:

- The system also includes a control sub-system that combines or relates the air-pressure measurements with the milk flow or milk volume measurements
- 10 • The control sub-system automatically adjusts the negative air-pressure to give the optimal milk flow or milk volume.
- The control sub-system automatically adjusts the negative air-pressure during a pumping session to give the optimal milk flow or milk volume within comfort constraints defined by the user.
- 15 • The air pressure sensor detects pressure created by the pumping mechanism.
- Sensor is a piezo air pressure sensor
- Air pressure sensor measures the negative air pressure during a normal milk expression session.
- Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to vary the operation of the pumping
- 20 mechanism so that it deliver consistent performance over time.
- Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to vary the operation of the pumping mechanism so that different pumping mechanisms in different breast pump systems all deliver consistent performance
- 25 • Air pressure sensor measures the negative air pressure during a calibration session, and the system uses the results to determine if the pumping mechanism is working correctly, within tolerance levels.
- The operation of the pumping mechanism is varied by altering the duty or pump cycle.
- 30 • The operation of the pumping mechanism is varied by altering the voltage applied to the pumping mechanism.
- Pumping mechanism is a piezo air pump.

- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 16 Elvie includes a microcontroller to enable fine tuning between pre-set pressure profiles**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to cause the pumping mechanism to deliver various pre-set pressure profiles and to permit the user to manually vary the pressure to a value or values that are in-between the values available from a pre-set pressure profile.

Optional:

- The user manually varies the pressure using a control interface on a housing of the breast pump system
- The user manually varies the pressure using a control interface on an application running on a wireless device such as a smartphone that is wirelessly connected to the breast pump system.
- The user manually varies the pressure by altering a control parameter of the pumping mechanism.
- The user manually varies the pressure by altering the duty cycle or timing of the

pumping mechanism.

- The user manually varies the pressure by altering the voltage applied to the pumping mechanism.
- The system includes an air pressure sensor configured to measure the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Pressure profile defines one or more maximum negative air pressure levels.
- Pressure profile defines one or more maximum negative air pressure levels, each for a pre-set time.
- Pressure profile defines one or more cycle time.
- Pressure profile defines peak flow rate.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 17 Elvie enables a user to set the comfort level they are experiencing**

- 30 A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to control the pumping mechanism and to permit the user to manually indicate the level of comfort that they are experiencing when the system is in use.

Optional:

- The user manually indicates the level of comfort that they are experiencing using a touch or voice-based interface on a housing of the breast pump system
- 5      • The user manually indicate the level of comfort that they are experiencing using a touch or voice-based interface on an application running on a wireless device, such as a smartphone, that is wirelessly connected to the breast pump system.
- The system stores user-indicated comfort levels together with associated parameters of the pumping system.
- 10     • The system is a connected device and a remote server stores user-indicated comfort levels together with associated parameters of the pumping system.
- The parameters of the pumping system include one or more of: pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing cycle of the pumping mechanism.
- 15     • System automatically varies parameters of the pumping system and then enables the user to indicate which parameters are acceptable.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- 20     • Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- 25     • Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- 30     • The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the



intensity of the light from the emitters that has been reflected from the surface of the milk.

5     **Feature 18     Elvie includes a microcontroller to dynamically and automatically alter pump operational parameters**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to automatically change one or more parameters of the pumping mechanism, and to automatically measure or relate milk  
10     expression data as a function of different values of one or more of these parameters.

Optional:

- 15     • The milk expression data includes one or more of the following: milk expression rate or quantity; comfort; optimal pumping mode; optimal pumping mode given remaining battery power.
- The system automatically calculates or identifies the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity and uses that set of parameters.
- 20     • The system automatically calculates or identifies the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity and uses that set of parameters if the comfort experienced by the user when those parameters are used is above a threshold.
- The system displays the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity to the user.
- 25     • The system displays the parameters of the pumping mechanism that correlate with maximum milk expression rate or quantity to the user and enables the user to manually select those parameters if they are acceptable.
- Parameters of the pumping mechanism includes pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing  
30     cycle of the pumping mechanism.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.

- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

**Feature 19 Elvie automatically learns the optimal conditions for let-down**

A breast pump system including (i) a pumping mechanism that applies negative air-pressure and (ii) a microcontroller programmed to dynamically change one or more parameters of the pumping mechanism, and to automatically detect the start of milk let-down.

Optional:

- The microcontroller is programmed to dynamically change one or more parameters of the pumping mechanism, to enable it to learn or optimize the parameters relating to milk let-down.
- The system automatically calculates or identifies or learns the parameters of the pumping mechanism that correlate with the quickest start of milk let-down.
- The system automatically calculates or identifies or learns the parameters of the pumping mechanism that correlate with the quickest start of milk let-down and uses that set of parameters if the comfort experienced by the user when those

parameters are used is above a threshold or are otherwise acceptable to the user.

- The system displays the parameters of the pumping mechanism that correlate with the quickest start of milk let-down to the user.
- The system displays the parameters of the pumping mechanism that correlate with the quickest start of milk let-down and enables the user to manually select those parameters if they are acceptable.
- parameters of the pumping mechanism includes pumping strength, peak negative air pressure; flow rate; voltage applied to the pumping mechanism; duty or timing cycle of the pumping mechanism.
- System includes an air pressure sensor that measures the negative air pressure delivered by the pumping mechanism.
- The air pressure sensor is a piezo air pressure sensor.
- Pumping mechanism is a piezo air pump.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a flexible diaphragm that seals, self-seals, self-energising seals or interference fit seals against a diaphragm housing that forms part of a breast shield.
- Breast pump system is wearable and includes a housing that is shaped at least in part to fit inside a bra.
- Breast pump system includes a milk container and a measurement sub-system that automatically measures the quantity of milk in the milk container.
- The measurement sub-system includes one or more light emitters and one or more light detectors, operating as part of a sub-system that measures or infers the quantity of the milk in the container and/or the height of the milk in the container above its base, and in which the light detectors detect and measure the intensity of the light from the emitters that has been reflected from the surface of the milk.

## **B. Elvie Piezo Air Pump Feature Cluster**

### **Feature 20 Elvie is wearable and has a piezo air-pump for quiet operation**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a piezo air-pump in the housing that is part of a closed loop system that drives, a separate, deformable diaphragm to generate negative air pressure.

Optional:

- 5
  - The deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
  - Piezo air pump is positioned at or close to the base of the housing.
  - There are two or more piezo air pumps.
  - There are two or more piezo air pumps mounted in a series arrangement.
- 10
  - There are two or more piezo air pumps mounted in a parallel arrangement.
  - The closed system is separated from a 'milk' side by a flexible diaphragm.
  - Deformable diaphragm is removably mounted against a part of a breast shield.
  - Deformable diaphragm is a unitary or one-piece object that is removably mounted against a part of a breast shield.
- 15
  - Deformable diaphragm is not physically connected to the piezo air-pump.
  - Piezo air-pump is a closed loop air-pump that drives a physically separate and remote deformable diaphragm that removably fits directly onto the breast shield
  - Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- 20
  - Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 25
  - The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
  - The piezo air pump weighs less than 25gm.
  - In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise. The piezo pump is fed by air that passes through an air filter.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 21 Elvie has a piezo air-pump and self-sealing diaphragm**

A breast pump system including:

- (a) a housing;
- (b) a piezo air-pump in the housing that is part of a closed loop system that drives, a physically separate, deformable, self-sealing diaphragm, to generate negative air pressure.

Optional:

- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement .
- The closed system is separated from a 'milk' side by the flexible diaphragm.
- Deformable diaphragm is removably mounted against a part of a breast shield.
- Deformable diaphragm is a unitary or one-piece object that is removably mounted against a part of a breast shield.
- Deformable diaphragm is not physically connected to the piezo air-pump.
- Piezo air-pump is a closed loop air-pump that drives a physically separate and remote deformable diaphragm that removably fits directly onto the breast shield.
- Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the

diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.

- 5       • The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- 10     • In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- The piezo pump is fed by air that passes through an air filter.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

15

#### **Feature 22     Elvie uses more than one piezo air pump in series**

A breast pump system including:

- (a)     a housing;
- (b)     multiple piezo air-pumps in the housing that drives a deformable diaphragm inside the housing to generate negative air pressure; in which the multiple piezo air-pumps can be operated at different times in series-connected and in parallel-connected modes.

20

Optional:

- 25       • The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Parallel connected mode is used during a first part of a pumping cycle to reach a defined negative air pressure more quickly than series connected mode would, and then the system switches to a series connected mode to reach a greater negative air pressure than series connected mode can reach.
- 30       • An actuator switches the system from parallel-connected piezo pump mode to series-connected piezo pump mode.

- Each piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- Each piezo air pump weighs less than 10 gm, and may weigh less than 6gm..
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- Each piezo pump is fed by air that passes through an air filter.
- Each piezo air pump forms part of a closed or closed loop system.
- Each piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- The piezo-air pumps are a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.

**Feature 23 Elvie is wearable and has a piezo air-pump, a breast shield and a diaphragm that fits directly onto the breast shield**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra;
- (b) a breast shield that attaches to the housing;
- (b) a piezo air-pump in the housing that drives a deformable diaphragm that fits directly onto the breast shield.

Optional:

- Deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Deformable diaphragm is removable from the diaphragm housing for cleaning.

- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Piezo air pump forms part of a closed or closed loop system.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.
- Piezo air pump is position at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise. The piezo pump is fed by air that passes through an air filter.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.



- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.

**Feature 24 Elvie is wearable and has a piezo air-pump for quiet operation and a re-useable, rigid milk container for convenience**

- 15 A wearable breast pump system including:
- (a) a housing shaped at least in part to fit inside a bra;
  - (b) a piezo air-pump in the housing;
  - (c) and a re-useable, rigid or non-collapsible milk container that when connected to the housing forms an integral part of the housing and that is also removable from the housing.

Optional:

- Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The closed system is separated from a 'milk' side by a flexible diaphragm.

- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably  
5 fits directly onto the breast shield.
- The deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- The deformable diaphragm is removable from the diaphragm housing for cleaning.
- 10 • Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 15 • Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- 20 • In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- The milk container forms the base of the system.
- 25 • The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- 30 • The milk container obviates the need for consumable or replaceable milk pouches.

**Feature 25 Elvie has a piezo-pump for quiet operation and is a connected device**

A breast pump system including

- (a) a housing;
- 5 (b) a piezo air-pump in the housing;
- (c) a milk container;
- (d) a data connectivity module that enables data collection relating to the operation of the piezo air-pump and transmission of that data to a data analysis system.

Optional:

- 10 • The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Transmission is to an application running on a connected device such as a smartphone, or a server, or the cloud.
- The data collection and transmission relates to any other operational data of the system.
- 15 • Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.
- There are two or more piezo air pumps mounted in a series arrangement.
- 20 • There are two or more piezo air pumps mounted in a parallel arrangement.
- The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably fits directly onto the breast shield.
- 25 • The closed system is separated from a 'milk' side by a flexible diaphragm.
- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.

- The deformable diaphragm is a flexible generally circular diaphragm that sits over a diaphragm housing that is an integral part of a breast shield.
- Deformable diaphragm is removable from the diaphragm housing for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 10 gm, and may weigh less than 6gm.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.
- A sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with the data connectivity module.
- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the intensity of that reflected light.
- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- The data analysis system analyses metrics such as any of the following: amount of milk expressed over one or more sessions, rate at which milk is expressed over one or more sessions, profile of the rate at which milk is expressed over one or more sessions.
- The data analysis system analyses metrics such as any of the following: pump speed, length of a single pumping session, negative air pressure or vacuum level,

peak negative air pressure or vacuum level, pump cycle time or frequency, changing profile of pump speed over a single pumping session time of day.

- The data analysis system analyses metrics such as any of the following: amount and type of liquids consumed by the mother, state of relaxation of the mother before or during a session, state of quiet experienced by the mother before or during a session, what overall milk expression profile the mother most closely matches.

**Feature 26 Elvie uses a piezo in combination with a heat sink that manages the heat produced by the pump.**

A breast pump system including:

- (a) a housing;
- (b) a piezo air-pump in the housing that drives a deformable diaphragm inside the housing to generate negative air pressure;
- (c) a heat sink to manage the heat produced by the piezo-air pump to ensure it can be worn comfortably.

Optional:

- The heat sink is configured to ensure that the maximum temperature of any parts of the breast pump system that might come into contact with the skin, especially prolonged contact for greater than 1 minute, are no more than 48°C and preferably no more than 43°C.
- The breast pump is wearable and the housing is shaped at least in part to fit inside a bra.
- Heat sink is connected to an air exhaust so that air warmed by the piezo pumps vents to the atmosphere.
- Heat sink warms a breast shield.
- Piezo air pump forms part of a closed or closed loop system.
- Piezo air pump is positioned at or close to the base of the housing.
- There are two or more piezo air pumps.

- There are two or more piezo air pumps, each connected to its own or a shared heat sink.
- There are two or more piezo air pumps mounted in a series arrangement.
- There are two or more piezo air pumps mounted in a parallel arrangement.
- 5 • The piezo-air pump is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.
- The piezo air-pump is a closed loop negative air-pressure system that drives a physically separate and remote deformable, self-sealing diaphragm that removably
- 10 fits directly onto the breast shield.
- The closed system is separated from a 'milk' side by a flexible diaphragm.
- A deformable diaphragm inside the housing is driven by negative air pressure generated by the piezo pump.
- The deformable diaphragm is a flexible generally circular diaphragm that sits over
- 15 a diaphragm housing that is an integral part of a breast shield.
- The deformable diaphragm is removable from the diaphragm housing for cleaning.
- Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the
- 20 diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- Nipple tunnel in the breast shield includes an opening on its lower surface that is positioned through which expressed milk flows directly into the milk container.
- 25 • The piezo pump delivers in excess of 400mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
- The piezo air pump weighs less than 25g.
- In operation, the breast pump system makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.
- 30 • In operation, the breast pump system makes approximately 24dB noise at maximum power and 22dB at normal power, against a 20dB ambient noise.

**Feature 27 Elvie is wearable and gently massages a mother's breast using small bladders inflated by air from its negative pressure air-pump**

A breast pump system including:

- (a) a housing;
- 5 (b) an air-pump in the housing that drives a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast;
- (c) in which the air pump also provides air to regularly or sequentially inflate one or more air bladders or liners that are configured to massage one or more parts of the
- 10 breast.

Optional:

- Air-pump is a piezo pump.
- Breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- 15 • Bladders or liners are formed in a breast shield that attaches to the housing.

**Feature 28 Elvie is wearable and gently warms a mother's breast using small chambers inflated by warm air from its negative pressure air-pump**

A breast pump system including:

- 20 (a) a housing;
- (b) an air-pump, such as a piezo pump, in the housing that drive a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast;
- (c) in which the air pump also provides warm air to regularly or sequentially inflate
- 25 one or more air chambers that are configured to apply warmth to one or more parts of the breast.

Optional:

- Breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- The air chamber is a deformable diaphragm positioned on a breast shield that attaches to the housing.

5

### C. Elvie Milk Container Feature Cluster

**Feature 29 Elvie is wearable and includes a re-useable, rigid milk container that forms the lower part of the pump, to fit inside a bra comfortably**

10 A wearable breast pump system configured including:

(a) a housing shaped at least in part with a curved surface to fit inside a bra and including a pumping mechanism;

(b) and a re-useable rigid or non-collapsible milk container that when connected to the housing forms an integral, lower part of the housing, with a surface shaped to  
15 continue the curved shape of the housing, so that the pump system can be held comfortably inside the bra.

Optional:

- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- 20 • The milk container is attached to the housing with a push action.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk  
25 pouches.
- The milk container includes an aperture, spout or lid that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the  
30 negative air-pressure from the pumping mechanism against an opening in a



breast shield, and milk flows under gravity through the opening into the milk container.

- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump mechanism to ensure that negative air-pressure is not applied to the milk container.
- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 30 Elvie is wearable and includes a milk container that latches to the housing with a simple push to latch action**

A wearable breast pump system including:

(a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;

(b) and a milk container that is attachable to the housing with a mechanism that releasably attaches or latches when the milk container is sufficiently pressed on to the housing with a single push action.

Optional:

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- Milk container, when connected to the housing, forms an integral, lower part of the housing and that is removable from the housing with a release mechanism that can be operated with one hand.

- Mechanism that releasably attaches or latches is a mechanical or magnetic mechanism.
- Mechanical mechanism includes flanges on the top of the milk container, or the sealing plate that seals the opening to the milk contained, that engage with and move past a surface to occupy a latched position over that surface when the milk container is pressed against the housing to lock into the housing.
- The housing includes a button that when pressed releases the milk container from the housing by flexing the surface away from the flanges so that the flanges no longer engage with and latch against the surface.
- Mechanism that attaches or latches the milk container into position does so with an audible click.
- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing by releasing the latch and moving the housing off the milk container.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.

- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

5     **Feature 31     Elvie is wearable and includes a removable milk container with an integral milk pouring spout for convenience**

A wearable breast pump system including:

- (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10    (b)     and a re-useable milk container that is connected to the housing with a surface shaped to continue the curved or breast-like shape of the pump, so that the pump can be held comfortably inside a bra and where the milk container includes a pouring spout for pouring milk.

Optional:

- 15     • Spout is integral to the milk container.
- Spout is integral to a removable lid to the milk container.
- Spout is positioned at or close to the front edge of the milk container.
- Spout is removable from the container, such as by clipping off the container.
- A teat is attachable to the spout.
- 20     • A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.
- The milk container forms the base of the system.
- 25     • The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.

- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- The pumping mechanism is a closed loop negative air-pressure system that applies negative pressure to a region surrounding a woman's breast to pump milk from that breast.

**Feature 32 Elvie is wearable and includes a removable milk container below the milk flow path defined by a breast shield for fast and reliable milk collection**

A wearable breast pump system including:

- (a) a housing including a pumping mechanism, the housing being shaped at least in part to fit inside a bra;
- (b) and a breast shield including a nipple tunnel shaped to receive a nipple, and including an opening that defines the start of a milk flow path;
- (c) a re-useable milk container that when connected to the housing is positioned entirely below the opening or the milk flow path, when the breast pump is positioned or oriented for normal use.

Optional:

- The milk container includes an aperture that sits directly underneath the opening in the nipple tunnel in the breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- 5 • Milk flows from the opening directly into the milk container.
- Milk flows from the opening directly into the milk container.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against the opening in the breast shield, and milk flows under gravity through the opening into the milk  
10 container.
- Milk flows from the opening directly onto a valve that is attached to the milk container, the valve closing whilst there is sufficient negative air pressure in the volume of air between the valve and the breast shield opening, and then opening to release the milk into the container when the air pressure rises sufficiently.
- 15 • Milk flows from the opening directly onto a valve that is attached to a spout, that is in turn attached to the milk container.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.
- 20 • A flexible rubber or elastomeric valve is mounted onto the milk container cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container, and milk flows towards and is retained by the duck bill valve whilst the valve is closed, and flows past the  
25 valve into the milk container when the negative air pressure is released and the valve opens.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched  
30 engagement with the housing.
- The two removable parts are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.

- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- 5     • Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has  
10     been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

15

**Feature 33     Elvie is wearable and includes a breast shield and removable milk container of optically clear, dishwasher safe plastic for ease of use and cleaning**

20     A breast pump system including:

- (a)     a housing including a pumping mechanism;
- (b)     and a breast shield defining a region shaped to receive a nipple, the region defining the start of a milk flow path;
- (c)     a re-useable, rigid or non-collapsible milk container that when connected to the  
25     housing is positioned to form the base of the housing;

and in which the breast shield and the milk container are made substantially of an optically clear, dishwasher safe material.

Optional:

- The material is a polycarbonate material, such as Tritan™.

- breast pump system is wearable and the housing is shaped at least in part to fit inside a bra.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- 5 • Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- 10 • Breast shield operates with a flexible diaphragm that flexes when negative air pressure is applied to it by an air pump system in the housing, and transfers that negative air-pressure to pull the breast and/or nipple against the breast shield to cause milk to be expressed.
- Flexible diaphragm is removable from a diaphragm housing portion of the breast shield for cleaning.
- 15 • Diaphragm housing includes an air hole that transfers negative air pressure to a nipple tunnel in the breast shield, the negative air pressure arising when the diaphragm moves away from the diaphragm housing and towards the housing, and the negative air pressure in the nipple tunnel pulling the breast and/or nipple against the breast shield to cause milk to be expressed.
- 20 • The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- 25 • The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- 30 • Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.

- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.
- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

**Feature 34 Elvie is wearable and includes various components that self-seal under negative air pressure, for convenience of assembly and disassembly**

A wearable breast pump system including:

- (a) a housing shaped at least in part to fit inside a bra and including an air pumping mechanism;
- (b) a breast shield;
- (c) a diaphragm that flexes in response to changes in air pressure caused by the air pumping mechanism and that seals to the breast shield;
- (d) a re-useable milk container that seals to the breast shield;

and in which either or both of the diaphragm and the re-useable milk container substantially self-seal under the negative air pressure provided by the pumping mechanism.

Optional:

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a



breast shield, and milk flows under gravity through the opening into the milk container.

- The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals against the conduit under the negative air pressure provided by the pumping mechanism.
- The 1 way valve is attached to the milk container, or a lid or spout of the milk container with an interference fit and is readily removed in normal use for separate cleaning.
- The diaphragm partly or wholly self-seals to the breast shield under the negative air pressure provided by the pumping mechanism.
- The diaphragm partly or wholly self-seals to the housing under the negative air pressure provided by the pumping mechanism.
- The diaphragm is attached to the diaphragm housing using elastomeric or rubber latches and is readily removed in normal use for separate cleaning.
- The breast shield and milk container are each pressed or pushed into engagement with the housing.
- The breast shield and milk container are each pressed or pushed into a latched engagement with the housing.
- The breast shield and milk container are each insertable into and removable from the housing using an action confirmed with an audible sound, such as a click.
- Breast shield is a one-piece item including a generally convex surface shaped to fit over a breast and a nipple tunnel shaped to receive a nipple.
- Breast shield is generally symmetrical about a centre-line running from the top to the bottom of the breast shield when positioned upright for normal use.
- Breast shield is configured to be rotated smoothly around a nipple inserted into the nipple tunnel to position a diaphragm housing portion of the breast shield at the top of the breast.
- Breast shield slides into the housing using guide members.
- Housing is configured to slide onto the breast shield, when the breast shield has been placed onto a breast, using guide members.
- Breast shield latches into position against the housing.

- Breast shield latches into position against the housing when spring plungers, such as ball bearings in the housing locate into small indents in the breast shield.
- Breast shield latches into position against the housing using magnets.

5     **Feature 35     Elvie is wearable and includes a spout at the front edge of the milk container for easy pouring**

A wearable breast pump system configured as a single unit and including:

- (a)     a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- 10    (b)     and a milk container that forms an integral part of the housing;
- (c)     a re-useable pouring spout that is positioned at or close to the front edge of the milk container.

Optional:

- 15    • Milk container is a multifunctional bottle, operating as both a storage container to contain milk that is being expressed, as well as a refrigeratable and freezable storage bottle for that milk, as well as a bottle from which that milk can be drunk by a baby.
- Spout is integral to a removable lid to the milk container.
- Spout is removable from the container, such as by clipping off the container.
- 20    • A teat is attachable to the spout.
- By placing the spout at or close to the front edge of the milk container, the milk container fully empties more readily than where the spout is placed in the middle of the lid of a milk container.
- The spout sits generally under an opening in the breast shield spout or nipple tunnel through which expressed milk flows.
- 25    • The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals against the conduit under the negative air pressure provided by the pumping mechanism.
- 30

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.

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**Feature 36 Elvie is wearable and includes a milk container that is shaped with broad shoulders and that can be adapted as a drinking bottle that baby can easily hold**

A wearable breast pump system configured as a single unit and including:

- 10 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) a breast shield;
- (c) a milk container that is removable from the housing and is shaped or configured to also serve as a drinking bottle that is readily held by a baby because it is wider than it is
- 15 tall.

Optional:

- Teat is attachable directly to the milk container.
  - Pouring or drinking spout is integral to the milk container.
  - The shoulders are at least 2cm in width, and the neck is no more than 1 cm in height, to enable a baby to readily grip and hold the container when feeding from the milk in the container.
  - Spout/teat/straw resides near the edge of the container's rim.
  - Milk container is a multifunctional bottle, operating as both a storage container to contain milk that is being expressed, as well as a refrigeratable and freezable storage bottle for that milk, as well as a bottle from which that milk can be drunk by a baby.
  - The re-useable milk container includes a 1 way valve that self-seals against a conduit from the breast shield and allows milk to pass into the container but not spill out, and in which the valve (a) closes and (b) partly or wholly self-seals
- 20
- 25

against the conduit under the negative air pressure provided by the pumping mechanism.

- The milk container includes an aperture, spout or lid that self-seals under the negative air-pressure from the pumping mechanism against an opening in a breast shield, and milk flows under gravity through the opening into the milk container.
- Spout is integral to the milk container.
- Spout is integral to a removable lid to the milk container.
- Spout is positioned at or close to the front edge of the milk container.
- Spout is removable from the container, such as by clipping off the container.
- A teat is attachable to the spout.
- A flexible rubber or elastomeric valve is mounted onto the cap or spout and includes a rubber or elastomeric duck-bill valve that stays sealed when there is negative air-pressure being applied by the air pump to ensure that negative air-pressure is not applied to the milk container.
- The milk container forms the base of the system.
- The milk container has a flat base so that it can rest stably on a surface.
- The milk container is removable from the housing.
- The milk container includes a clear or transparent wall or section to show the amount of milk collected.
- The milk container is sealable for storage.
- The milk container obviates the need for consumable or replaceable milk pouches.
- The milk container includes an aperture that sits directly underneath an opening in a nipple tunnel of a breast shield, and expressed milk flows under gravity through the opening in the nipple tunnel and into the milk container through the pouring spout in the milk container.
- The milk container is made using a blow moulding construction.
- The milk container has a large diameter opening to facilitate cleaning that is at least 3cm in diameter.
- The large opening is closed with a bayonet-mounted cap with an integral spout.

**D. Elvie IR System Feature Cluster****Feature 37 Elvie is wearable and includes a light-based system that measures the quantity of milk in the container for fast and reliable feedback**

A system for milk volume determination, for use as part of a breast pump, or breast milk  
 5 collecting device, including:

- (a) a re-useable rigid or non-collapsible milk container;
- (b) at least one light emitter, configured to direct radiation towards the surface of the milk;
- (c) at least one light detector, configured to detect reflected radiation from the  
 10 surface of the milk;

wherein the light emitters and detectors operate as part of a sub-system that measures the height of, or infers the quantity of, the milk in the container.

Optional:

The wearable breast pump system includes:

- 15 (a) a housing shaped at least in part to fit inside a bra and including a pumping mechanism;
- (b) and a breast shield;
- (c) a re-useable rigid or non-collapsible milk container that when connected to the housing is positioned to form the base of the housing;

20 and in which the top of the container includes an optically clear region that is aligned below one or more light emitters positioned in the base of the housing.

- The sub-system measures or infers the quantity and/or the height of the liquid in the container by using one or more light emitters and light detectors to detect light from the emitters that has been reflected by the liquid, and measuring the  
 25 intensity of that reflected light.
- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.

- The sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with a data connectivity module.
- Where the quantity or level exceeds a threshold, then the pumping mechanism automatically changes mode, e.g. from a stimulation mode to an expression mode.
- Where the quantity or level exceeds a threshold, then the pumping mechanism automatically stops.
- Milk-flow data is captured and stored.
- If milk-flow falls below a threshold, then a notification is provided to the mother.

### **Feature 38 The separate IR puck for liquid quantity measurement**

A liquid-level measuring system for measuring the quantity of liquid in a container for a breast pump; the system including:

- (a) one or more light emitters directing light at the surface of the liquid in the container;
- (b) one or more light receivers configured to detect light from the light emitters that has been reflected from the liquid;
- (c) a sub-system that infers, measures or calculates the quantity in the liquid using measured properties of the detected light;
- (d) a collar or other fixing system that positions the system over the container.

Optional:

- The quantity of milk is measured as milk enters the container or as milk is removed from the container.
- Measured property includes the reflected light intensity

### **Feature 39 The separate IR puck combined with liquid tilt angle measurement**

A liquid-level measuring system for measuring the tilt angle of liquid in a container; the system including:

(a) one or more light emitters directing light at the surface of the liquid in the container;

(b) one or more light receivers configured to measure properties of the light reflected from the liquid;

5 (c) a sub-system including an accelerometer that infers, measures or calculates the tilt angle of the liquid using measured properties of the detected light;

(d) a collar or other fixing system that positions the system over the container.

Optional:

- Measured property includes the reflected light intensity
- 10 • The quantity of liquid is measured as liquid enters the container or as liquid is removed from the container.
- Sub-system includes an accelerometer and uses a signal from the accelerometer to determine if the liquid is sufficiently still to permit the sub-system to accurately measure or infer the quantity and/or the height of the liquid in the container.
- 15 • The sub-system measures or infers the quantity and/or the height of the liquid in the container and shares that data with a data connectivity module.

### **Generally applicable optional features**

- Weight of the entire unit, unfilled, is under 250g and preferably 214g.
- 20 • Silver based bactericide is used on all parts that are not steam or heat sterilized in normal cleaning.
- Housing includes a rechargeable battery.
- System is self-contained.
- System is a closed loop system.
- 25 • Breast pump system is a self-contained, wearable device that includes an integral rechargeable battery, control electronics, and one or more air pumps operating as a closed system, driving a flexible diaphragm that in turn delivers negative air-pressure to the breast, to cause milk to be expressed.
- Housing has a generally rounded or convex front surface and has a generally tear-drop shape when seen from the front.
- 30

**E. Bra Clip Feature Cluster****Feature 40 Bra Adjuster**

5 A bra adjuster for a nursing or maternity bra, the nursing or maternity bra including a bra cup with a flap that can be undone to expose the nipple, and the flap attaching to the shoulder strap using a clasp, hook or other fastener attached to the flap, and a corresponding fastener attached to the shoulder strap;

10 and in which the bra adjuster is attachable at one end to the fastener attached to the flap, and at its other end to the fastener attached to the shoulder strap, and hence increases the effective bra cup size sufficiently to accommodate a wearable breast pump, and is also detachable from the flap and shoulder strap.

Optional:

- 15 • Bra adjuster is retained in position on the bra during normal wearing of the bra, even when the flap is attached directly to the shoulder strap, and is used to increases the effective bra cup size only when the wearable breast pump is used.
- Bra adjuster is extensible or elastic.
- Bra adjuster is of a fixed length.
- 20 • Bra adjuster includes a clip that the user can slide onto the bra strap to secure the bra adjuster in position.
- Bra adjuster is machine-washing washable.

**F. Other Features that can sit outside the breast pump context**

25 **Feature 41 Wearable device using more than one piezo pump connected in series or in parallel**

A wearable device including multiple piezo pumps mounted together either in series or in parallel.

Optional:



- The wearable device is a medical wearable device.
- The piezo pumps air or any liquid etc.
- The system can switch between a parallel mode and a series mode to arrive to lower or higher pressure quicker.

5

**Feature 42 Wearable medical device using a piezo pump and a heat sink attached together.**

A wearable medical device including a piezo pump and a heat sink attached together.

Optional

- 10 • The wearable device uses more than one piezo pump connected in series.
- The wearable device uses more than one piezo pump connected in parallel.
- Each piezo pump is connected to its own heat sink, or to a common heat sink.
- The or each heat sink is configured to ensure that the maximum temperature of any parts of the breast pump system that might come into contact with the skin, especially prolonged contact for greater than 1 minute, are no more than 48°C and preferably no more than 43°C
- 15 • The wearable device includes a thermal cut out.
- Excess heat is diverted to a specific location on the device that is selected to not be in prolonged contact with the skin of the user, in normal use.
- 20 • Use cases application:
  - Wound therapy
  - High degree burns
  - Sleep apnea
  - Deep vein thrombosis
  - 25 ○ Sports injury.
- Wearable medical device is powered/charged via USB.

**Note**

It is to be understood that the above-referenced arrangements are only illustrative of the application for the principles of the present invention. Numerous modifications and alternative arrangements can be devised without departing from the spirit and scope of

30

the present invention. While the present invention has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred example(s) of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications can be made  
5 without departing from the principles and concepts of the invention as set forth herein.

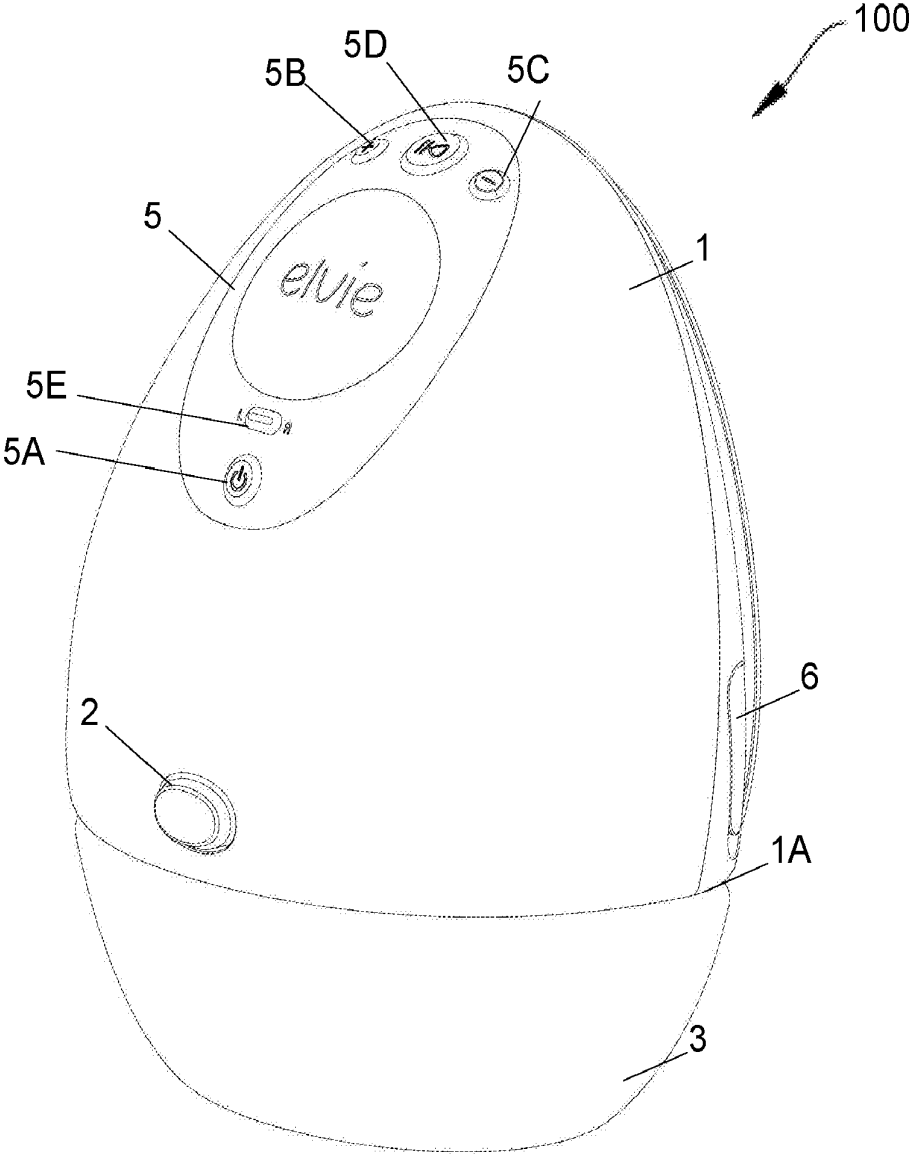


FIGURE 1

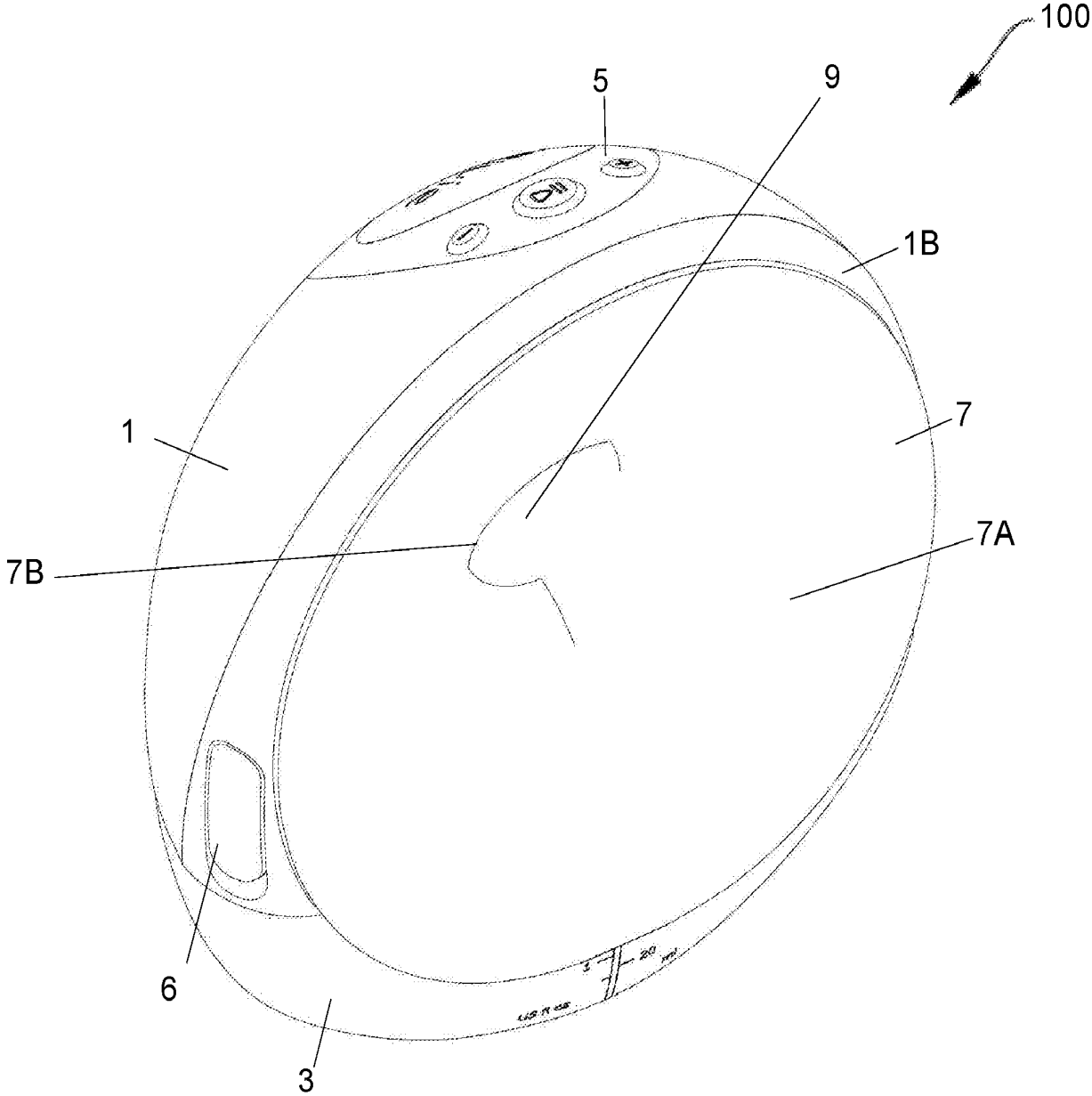


FIGURE 2

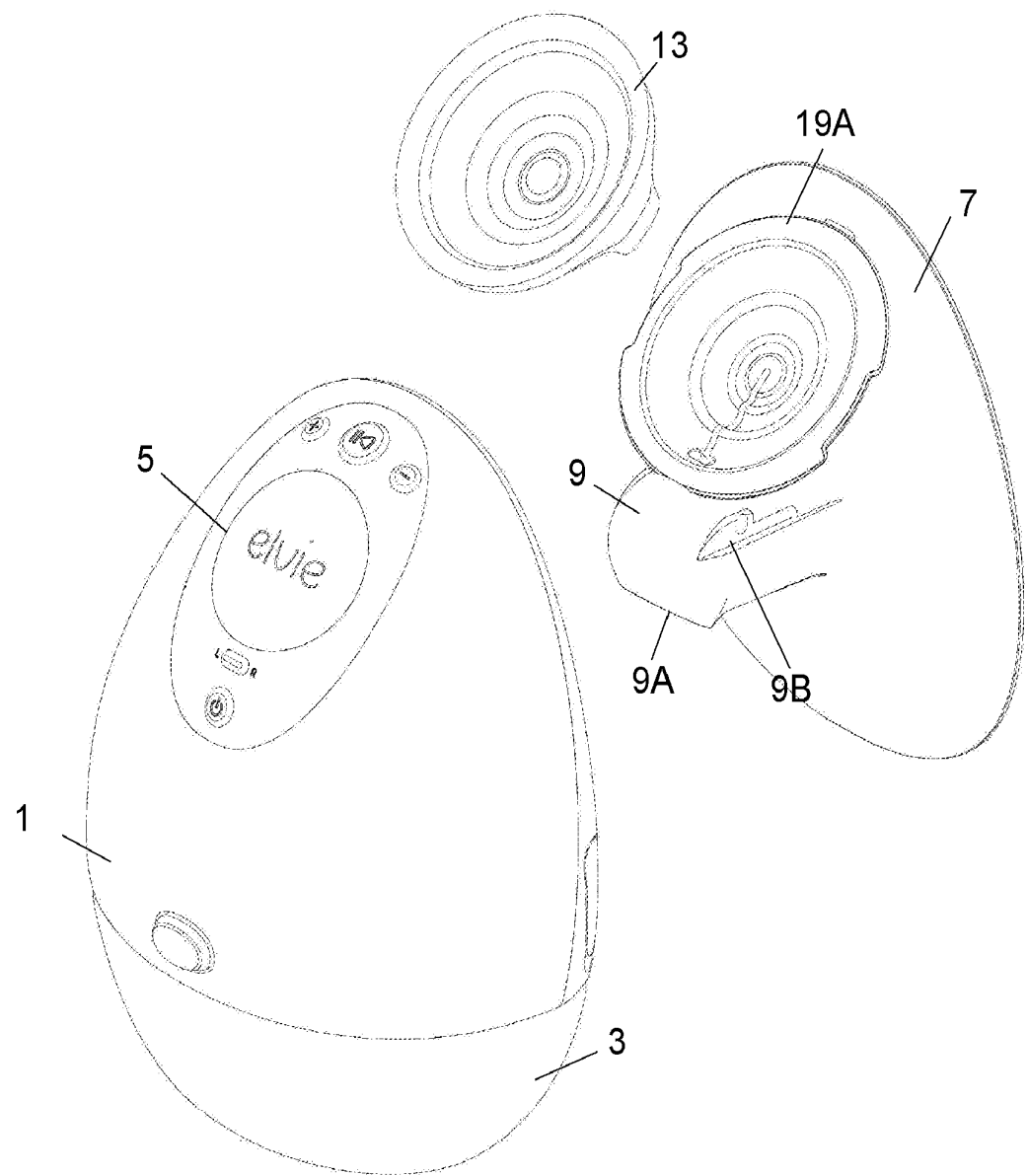


FIGURE 3

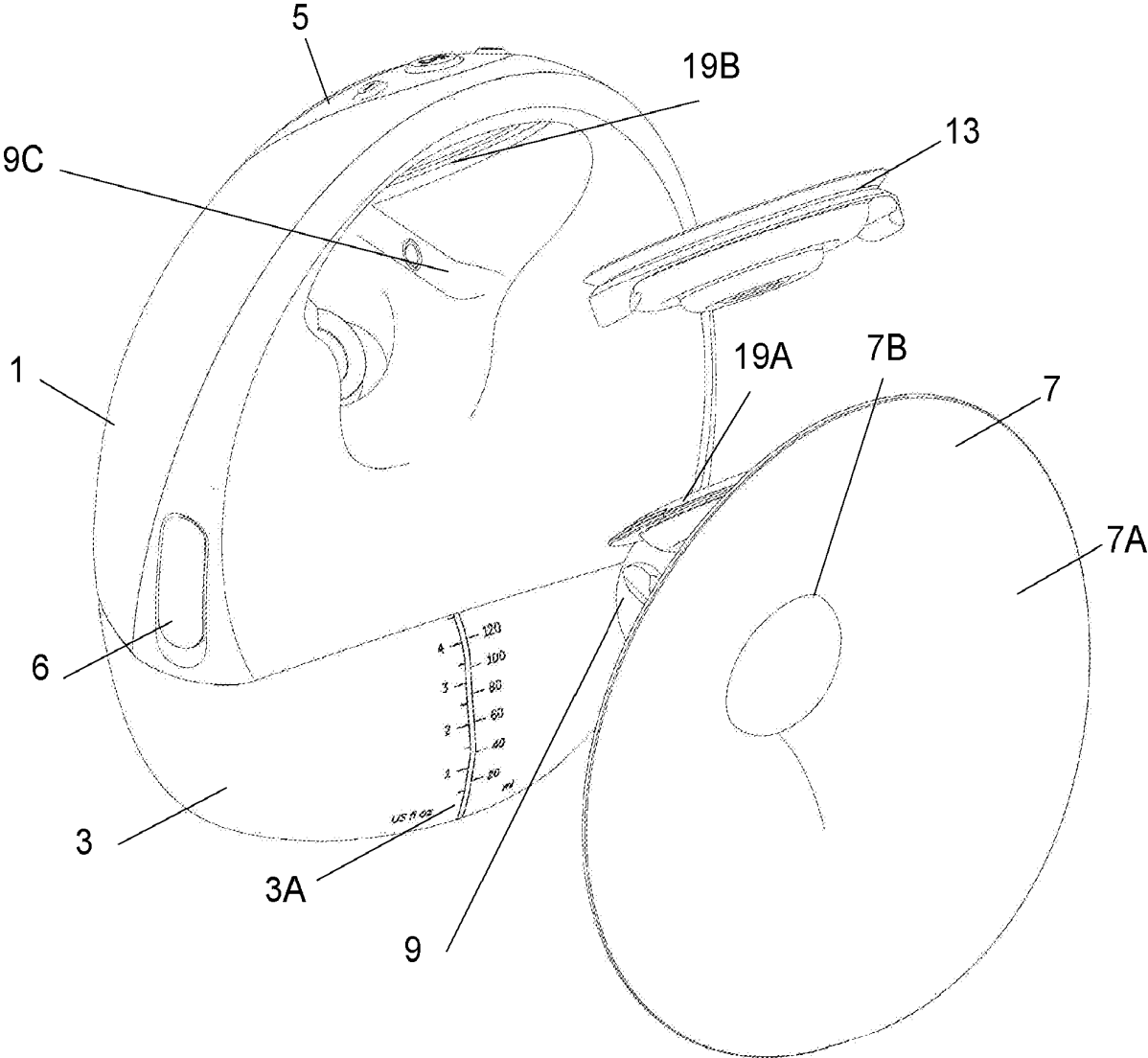


FIGURE 4

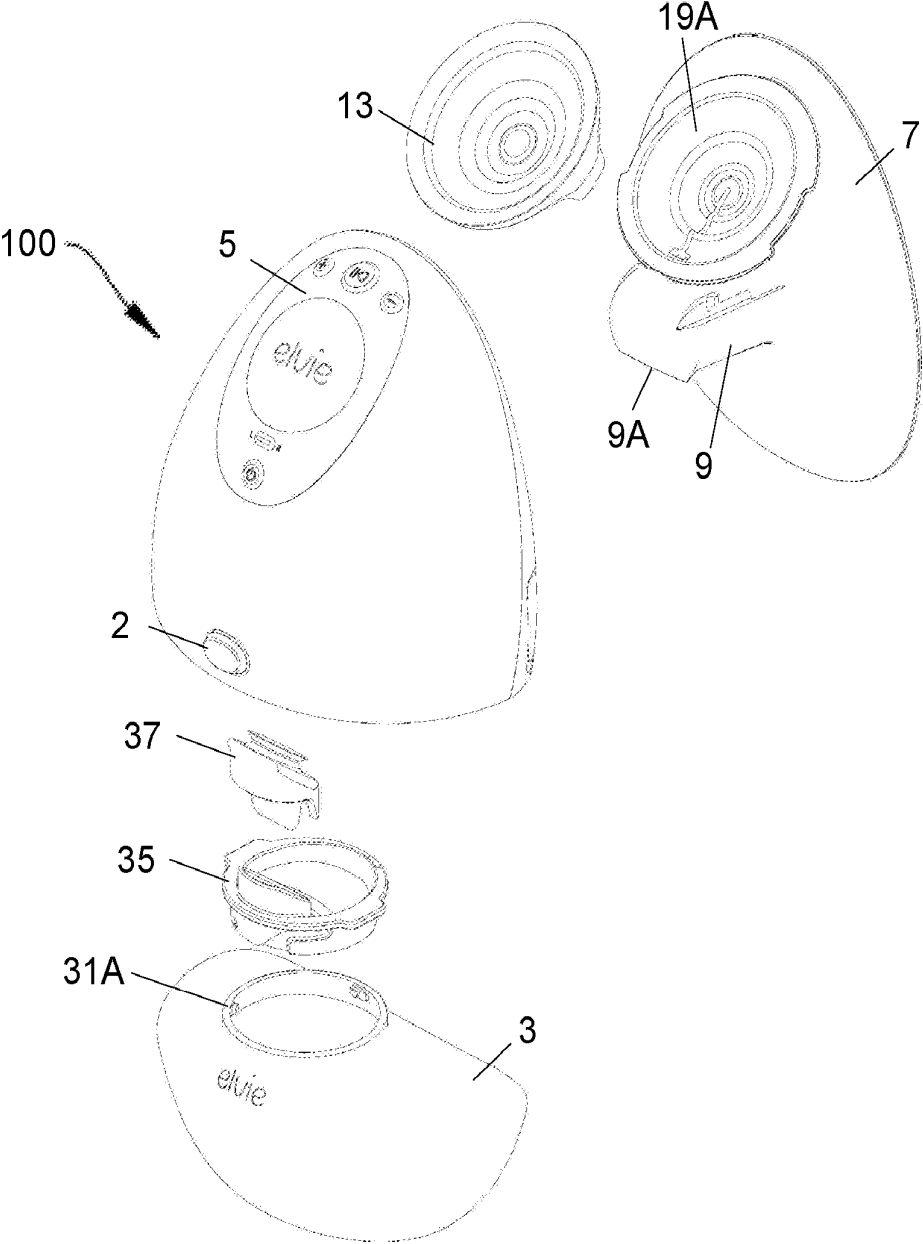


FIGURE 5

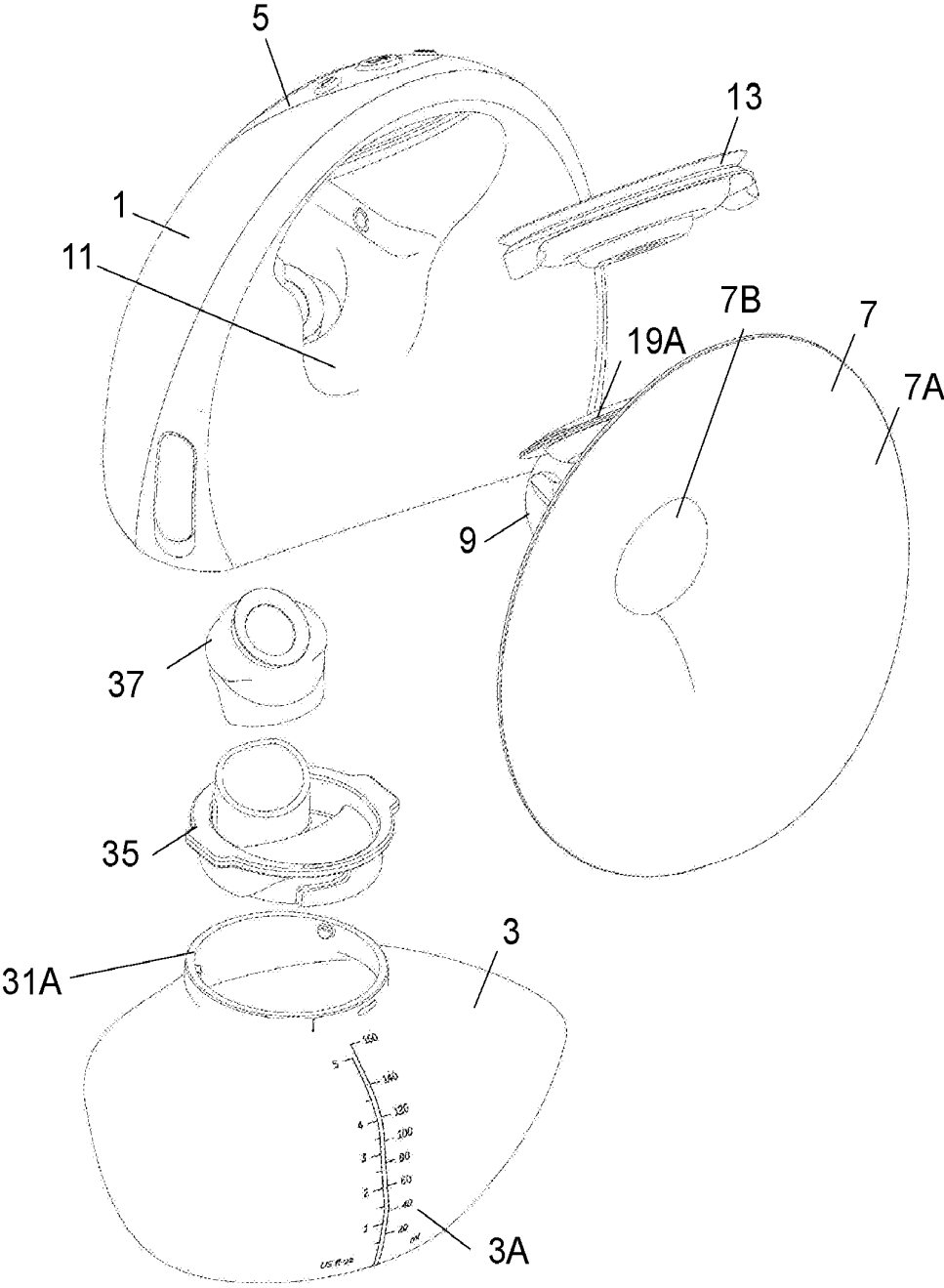
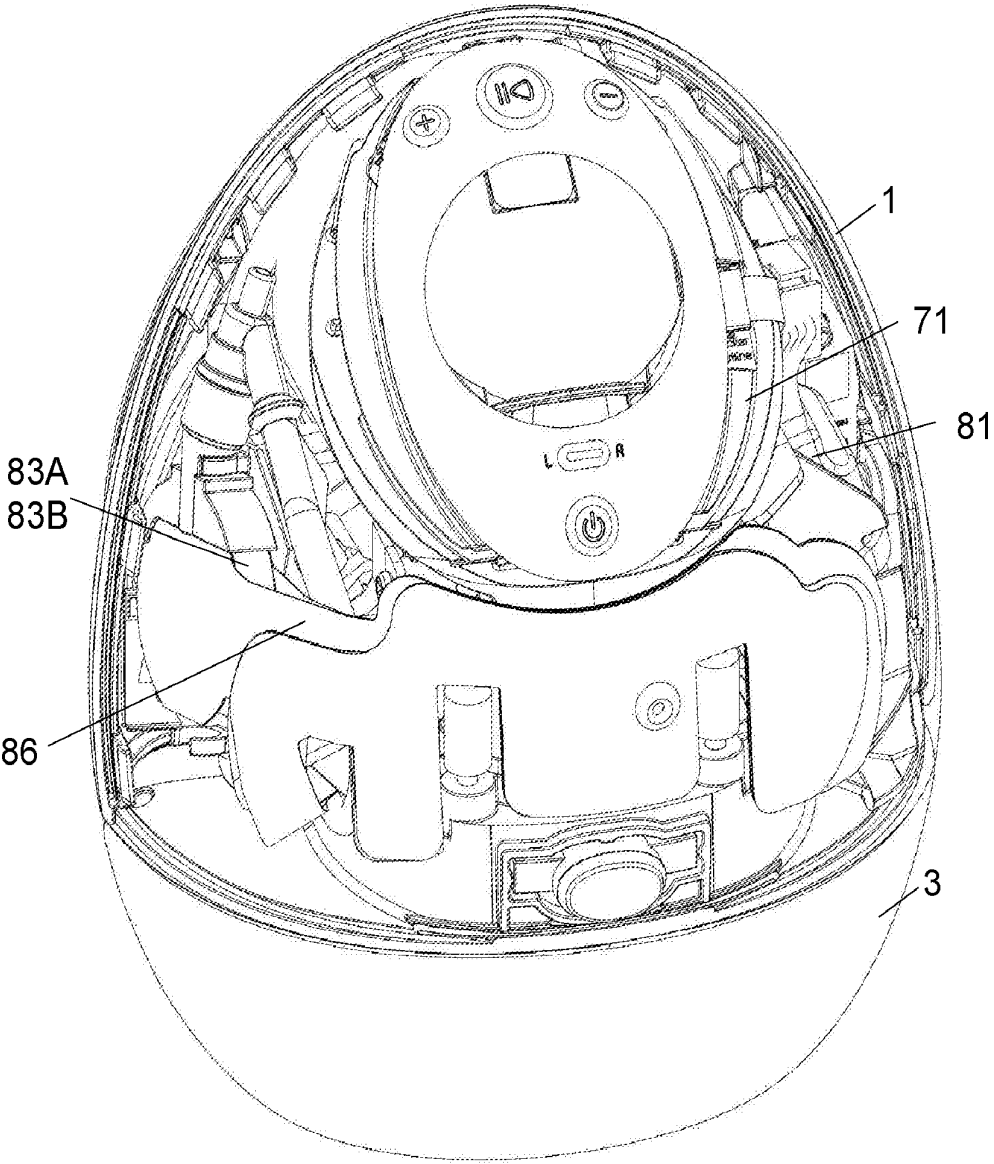


FIGURE 6





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FIGURE 7

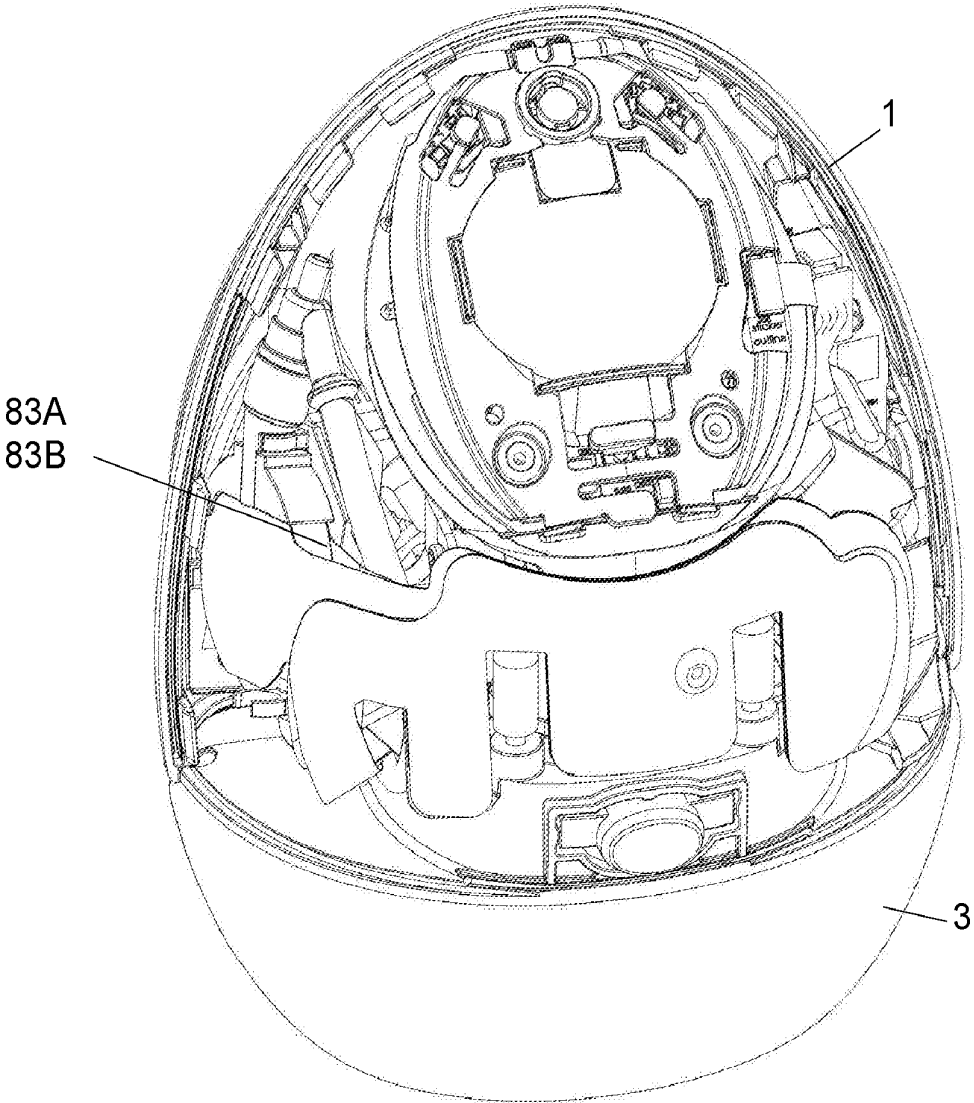


FIGURE 8

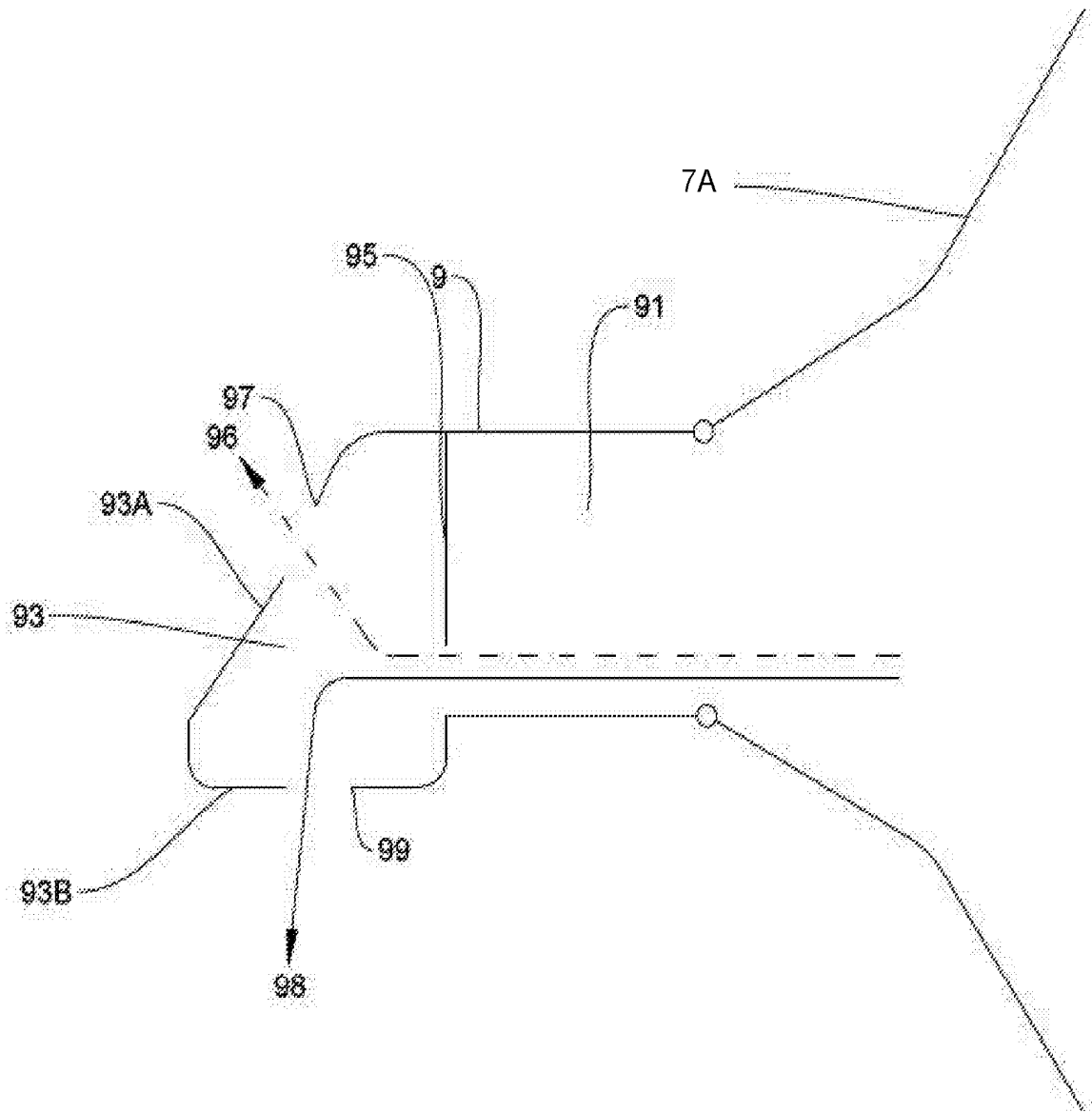


FIGURE 9

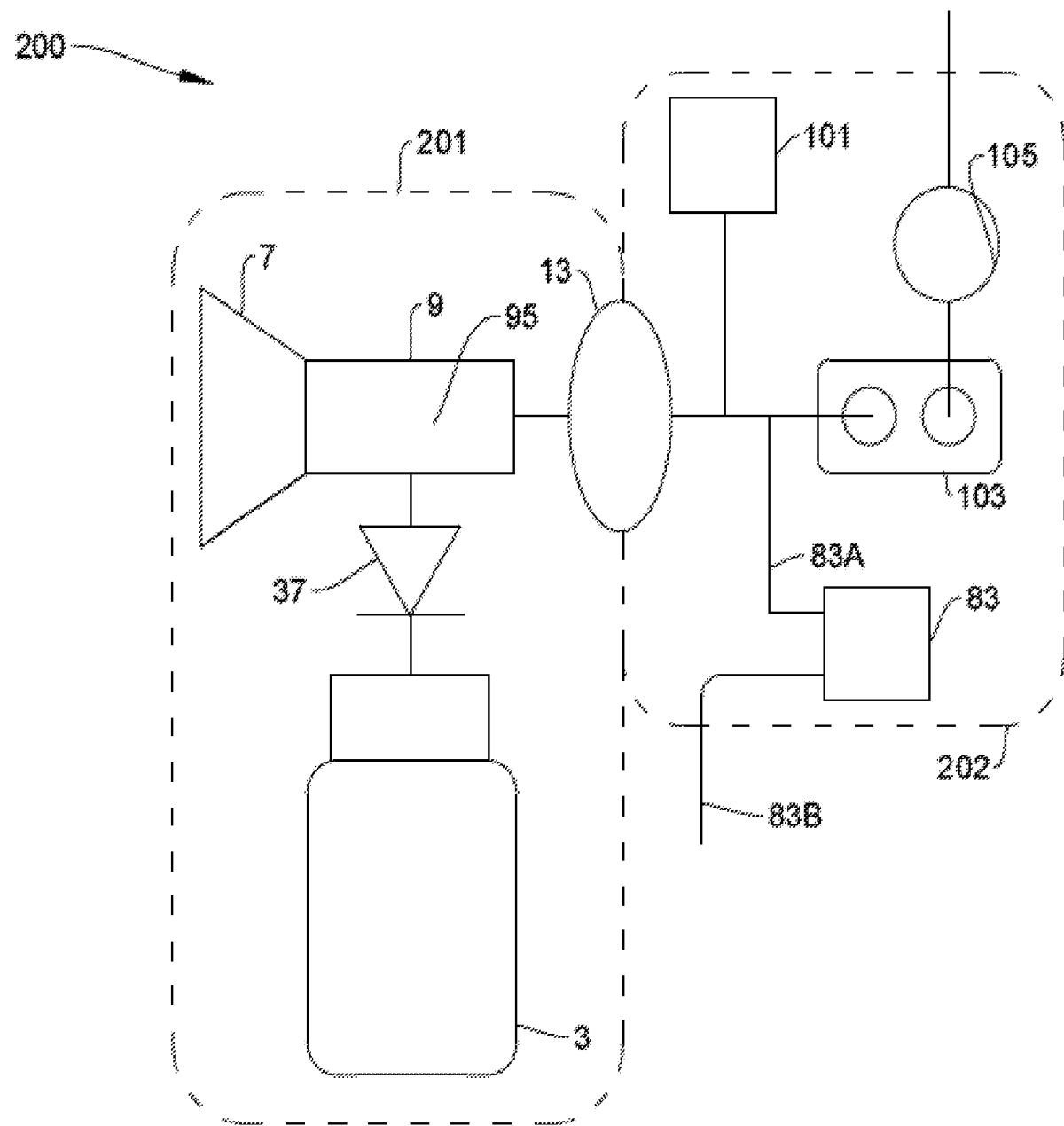


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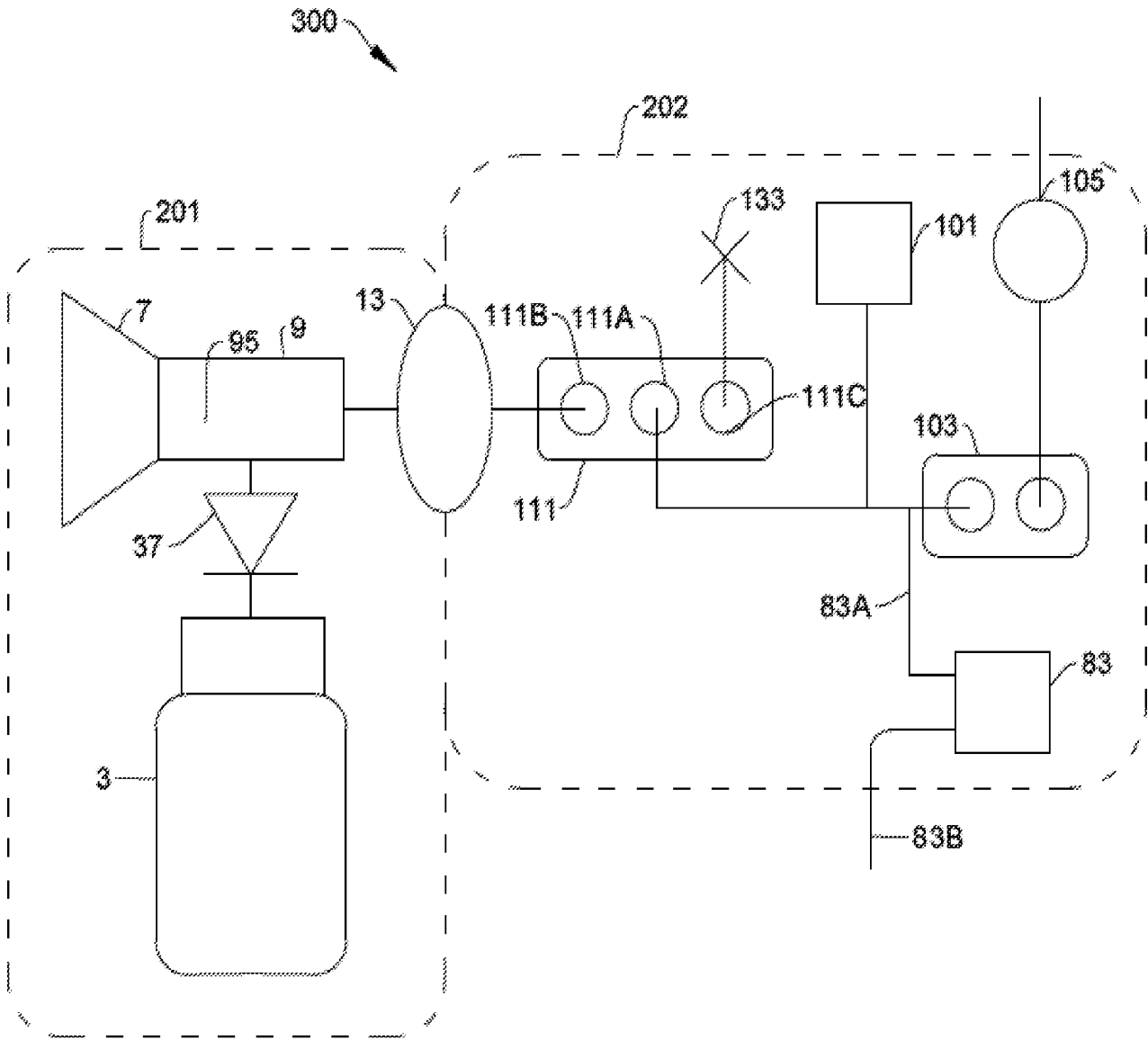


FIGURE 11

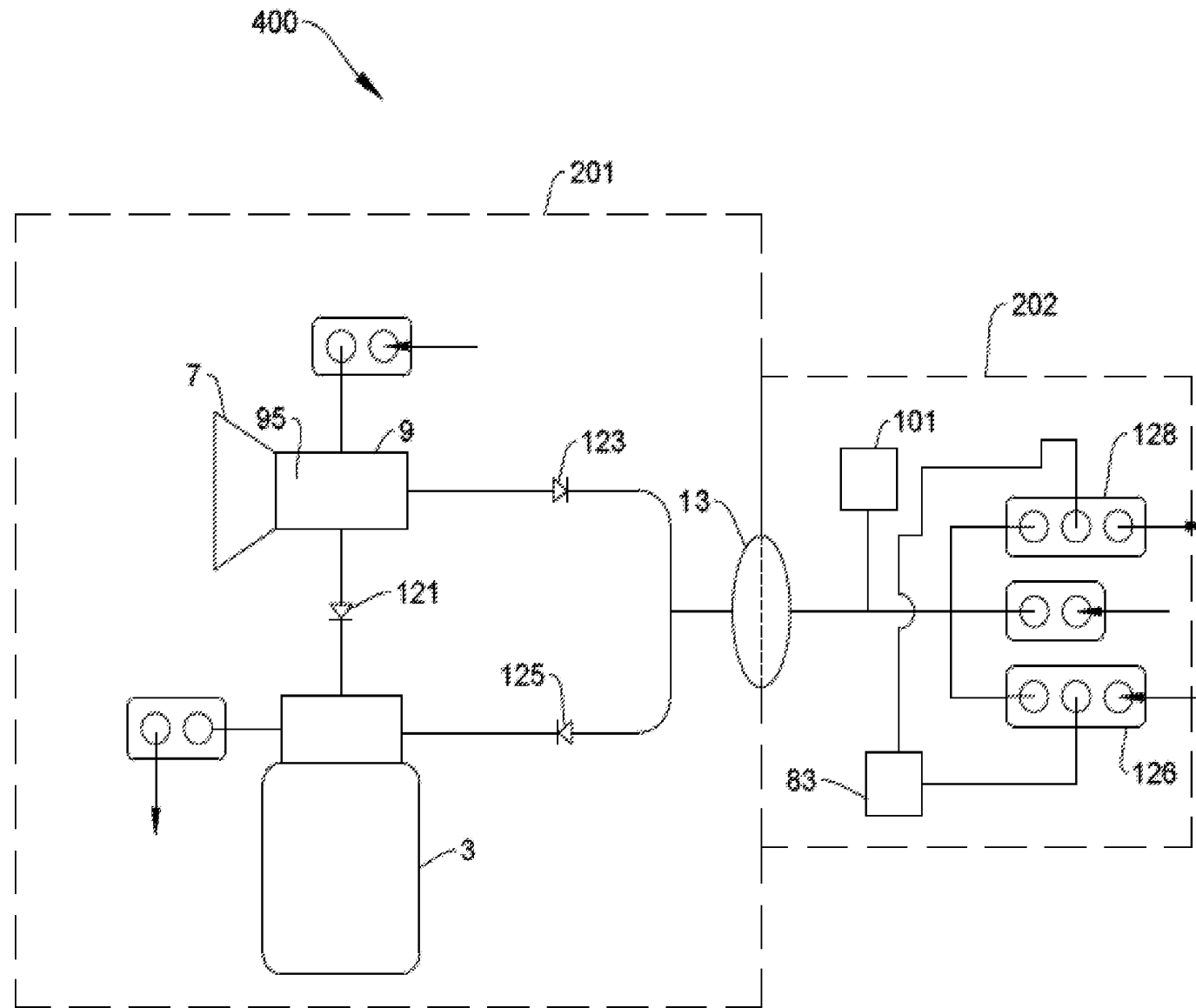
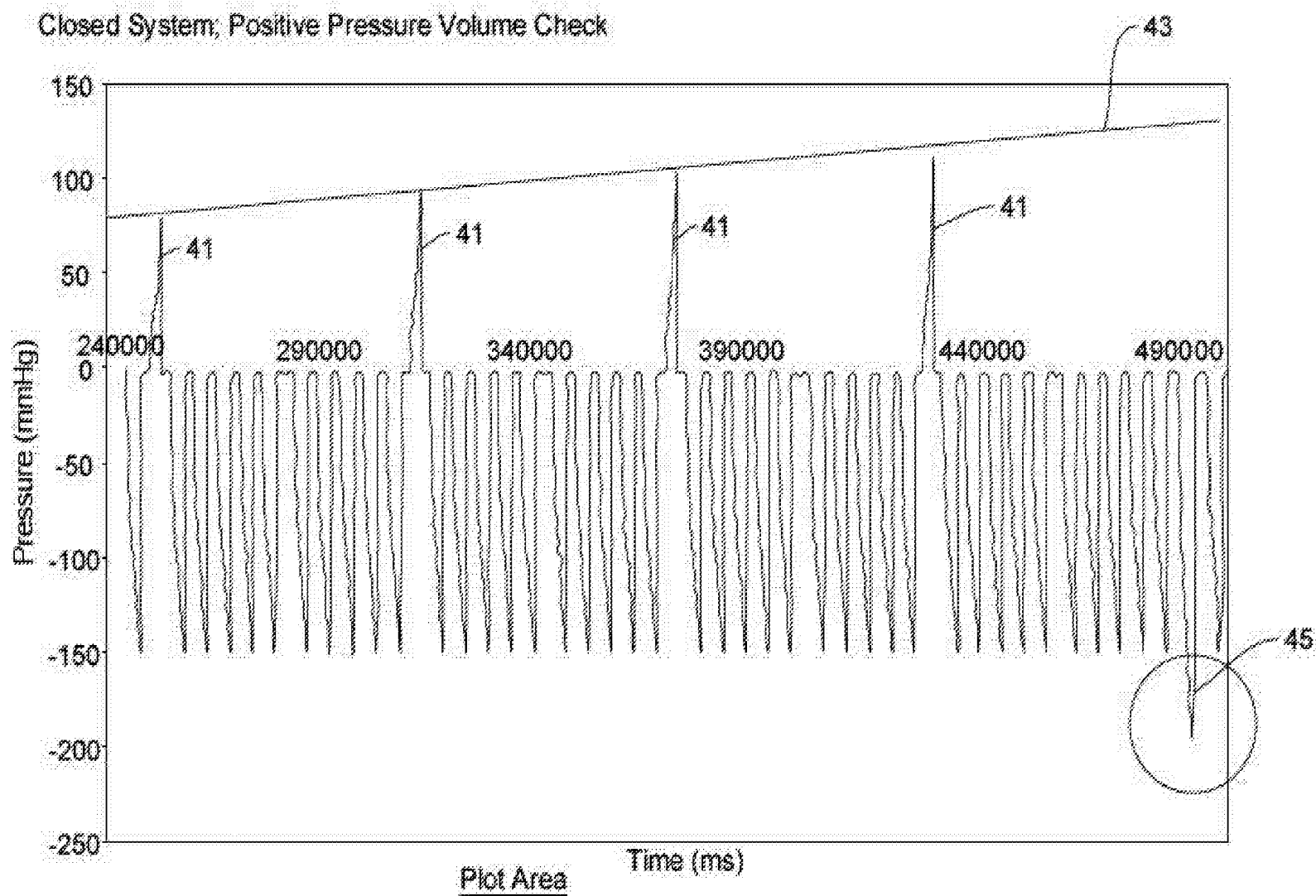
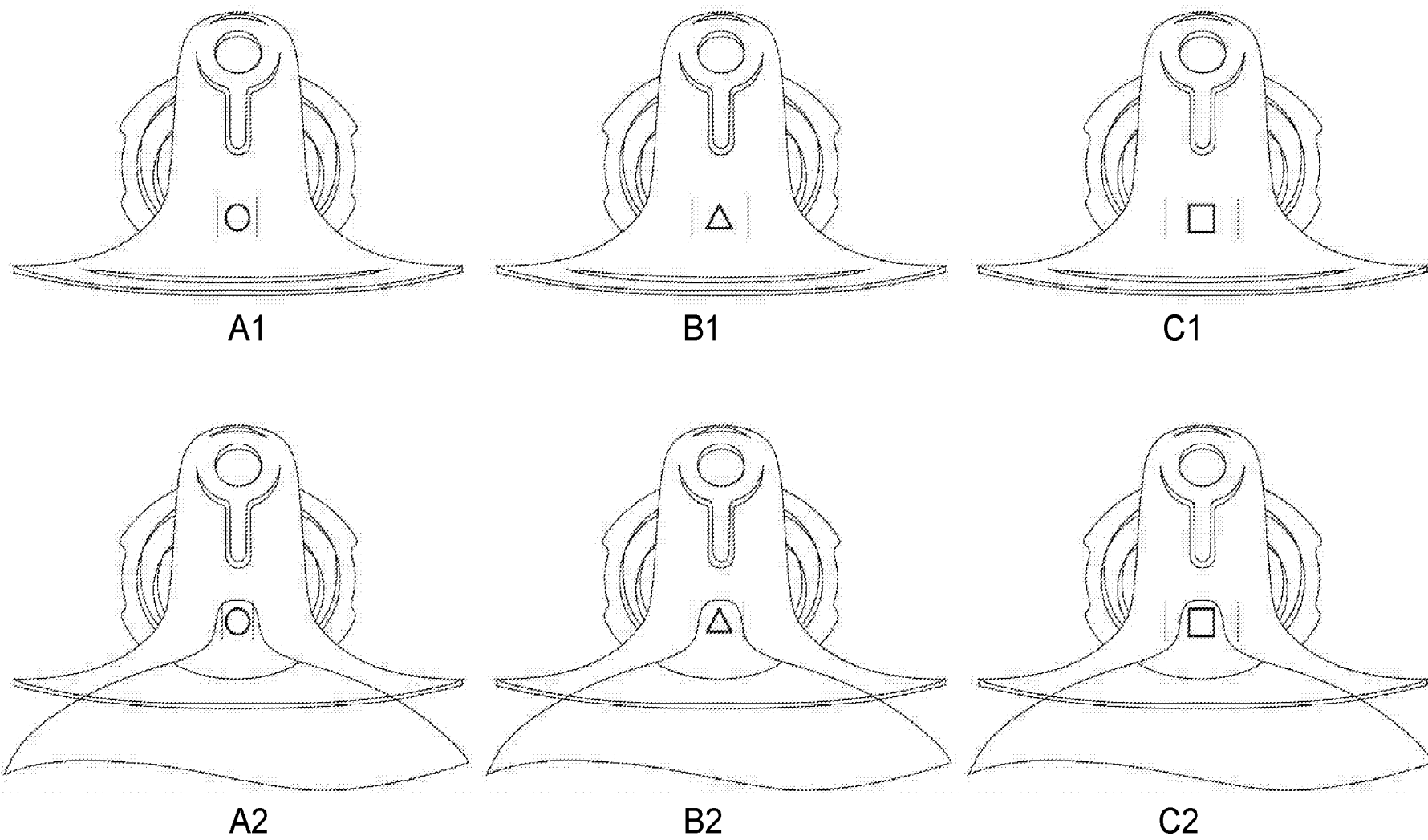


FIGURE 12



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FIGURE 13



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FIGURE 14



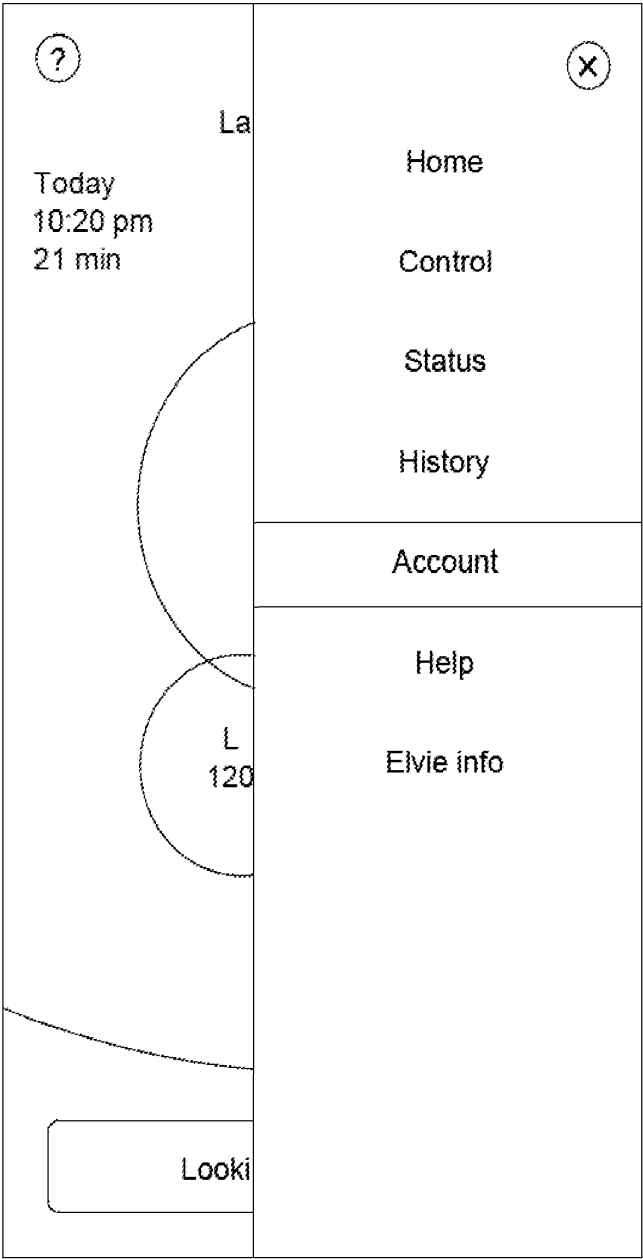


FIGURE 15

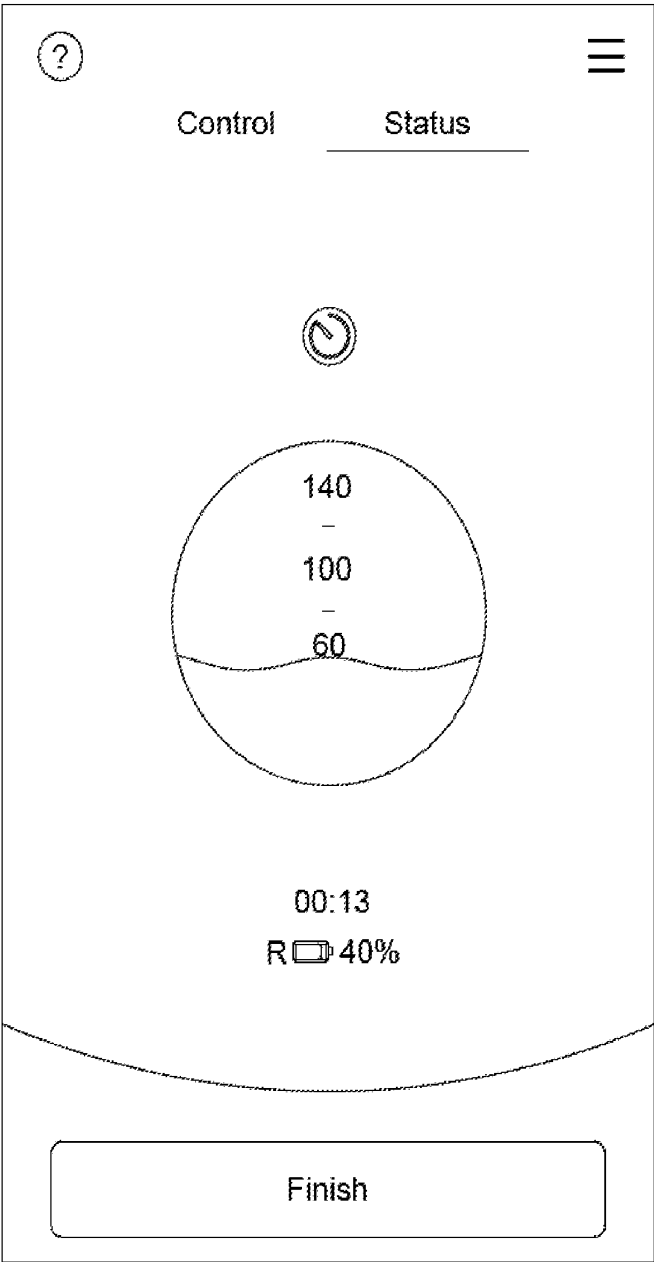


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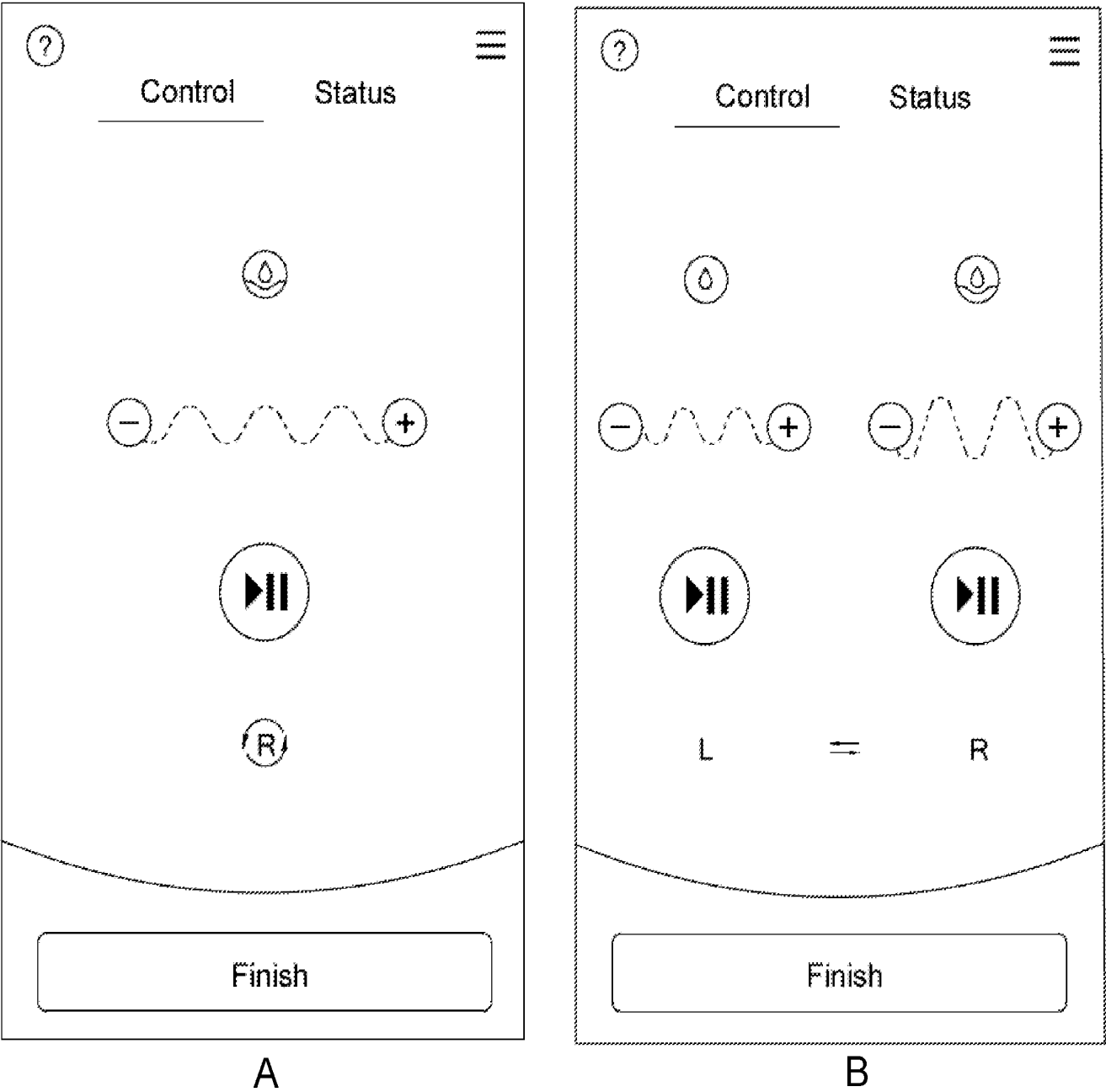


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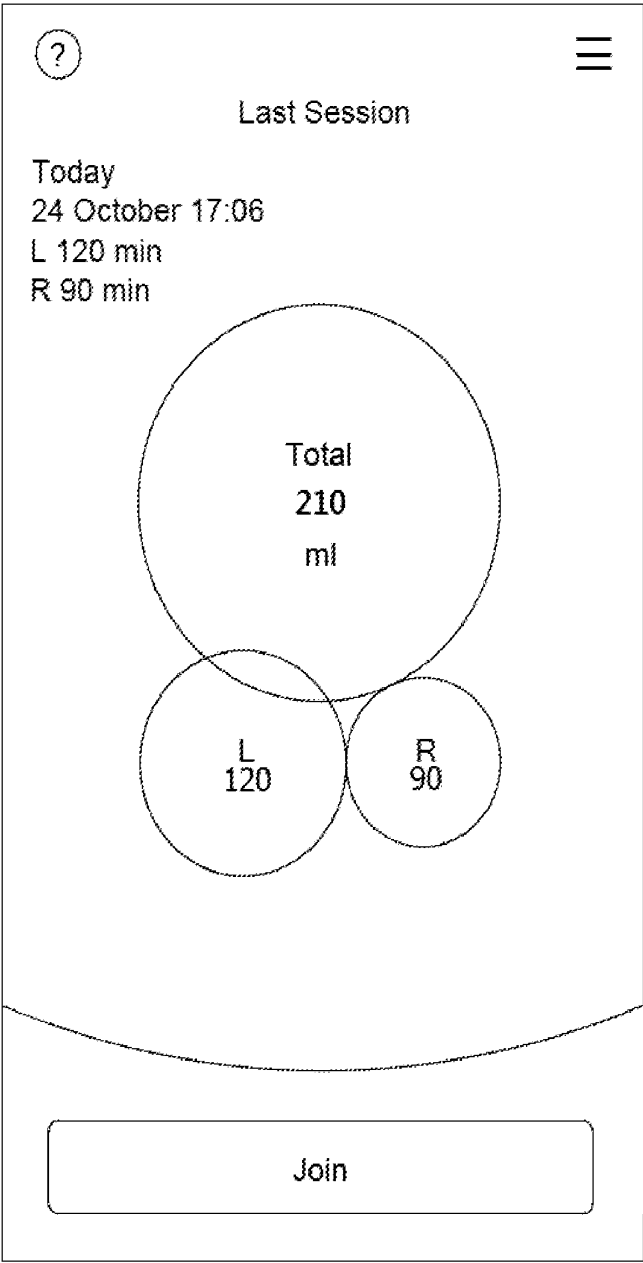


FIGURE 18

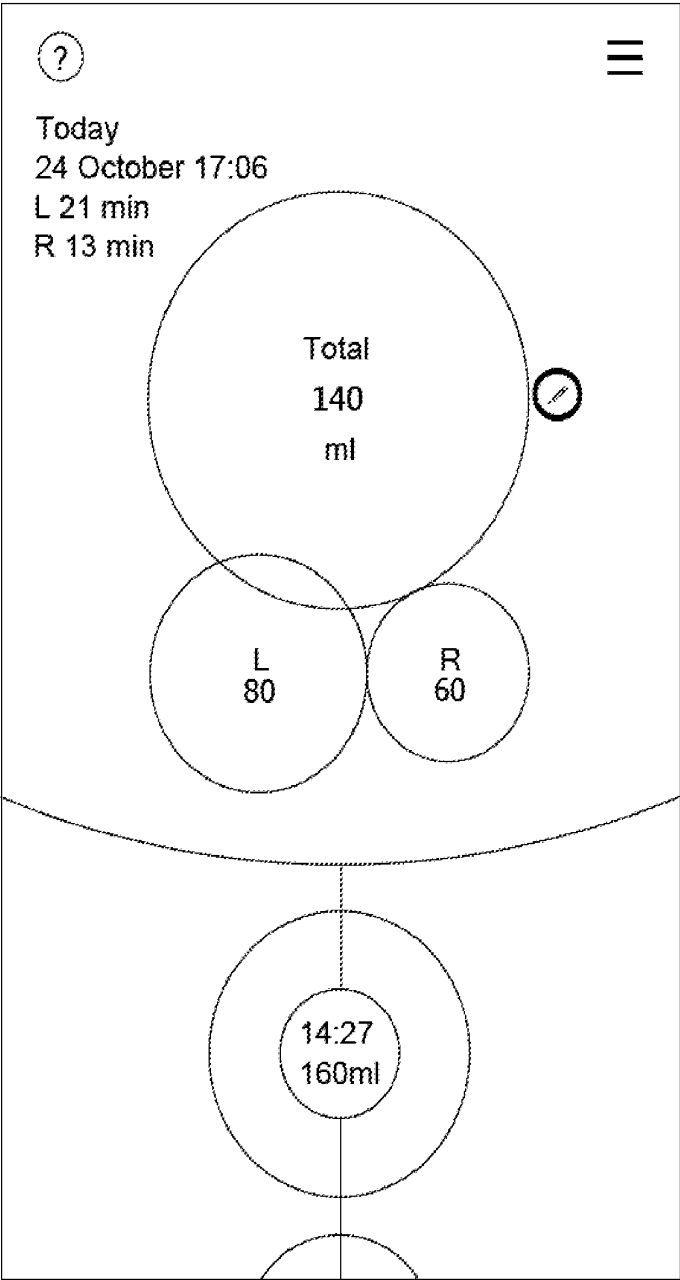


FIGURE 19

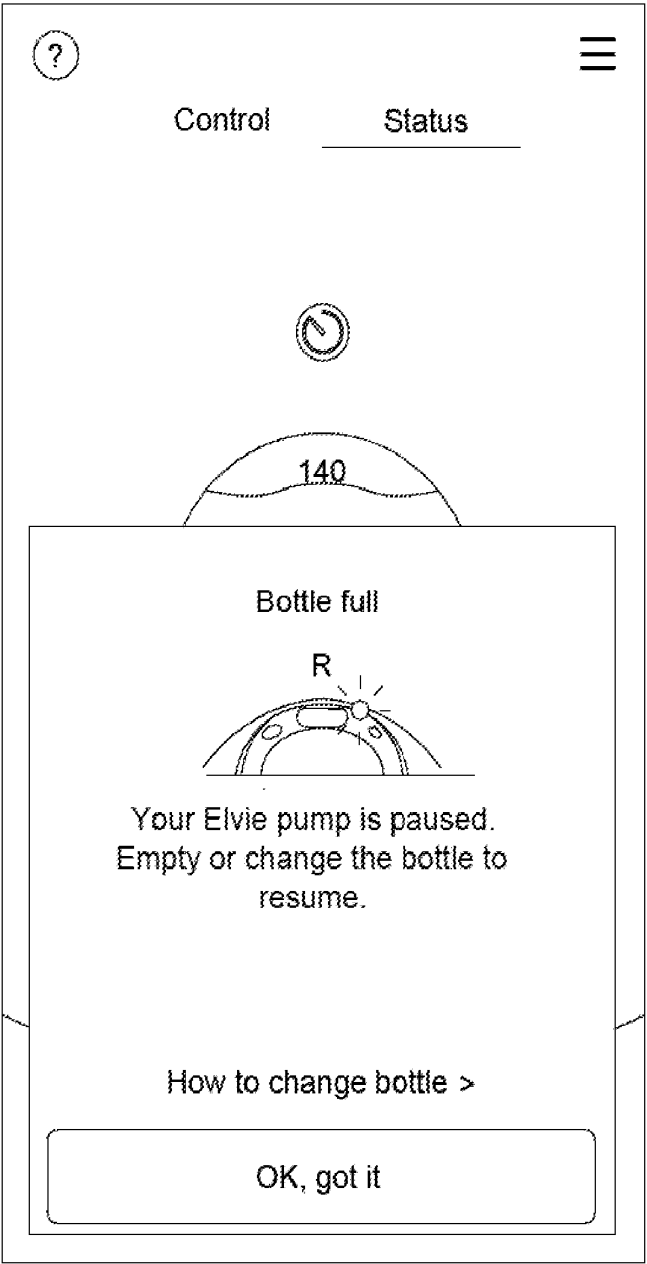


FIGURE 20

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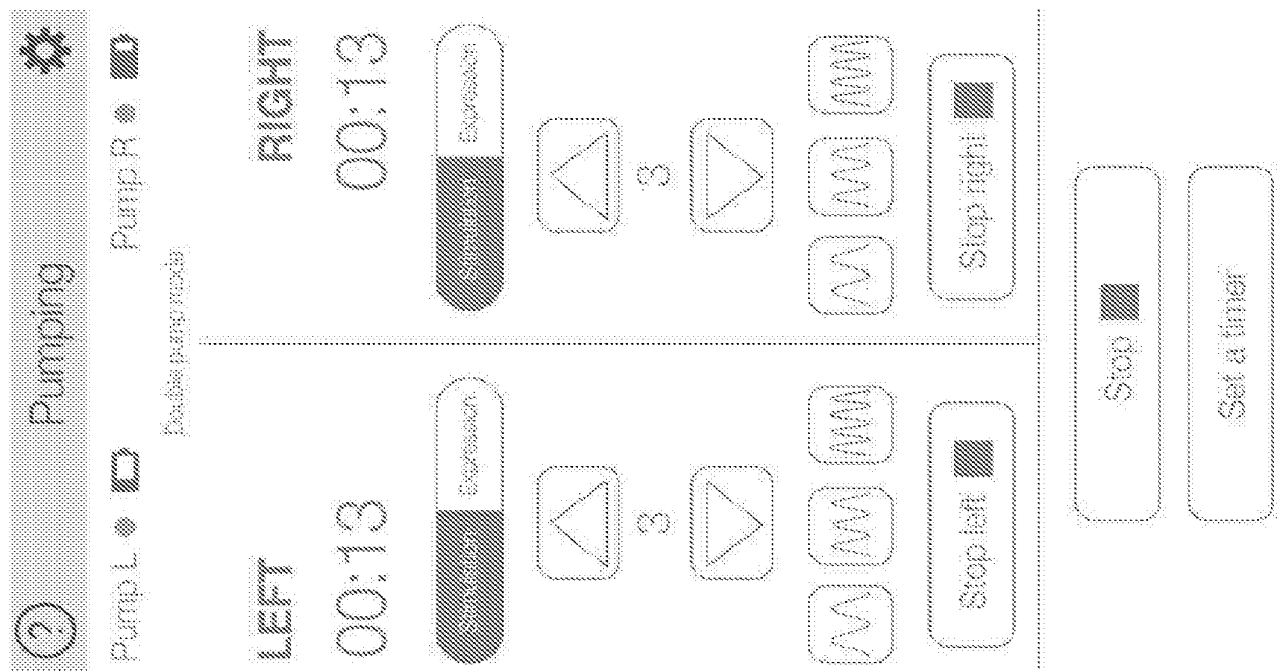


FIGURE 21

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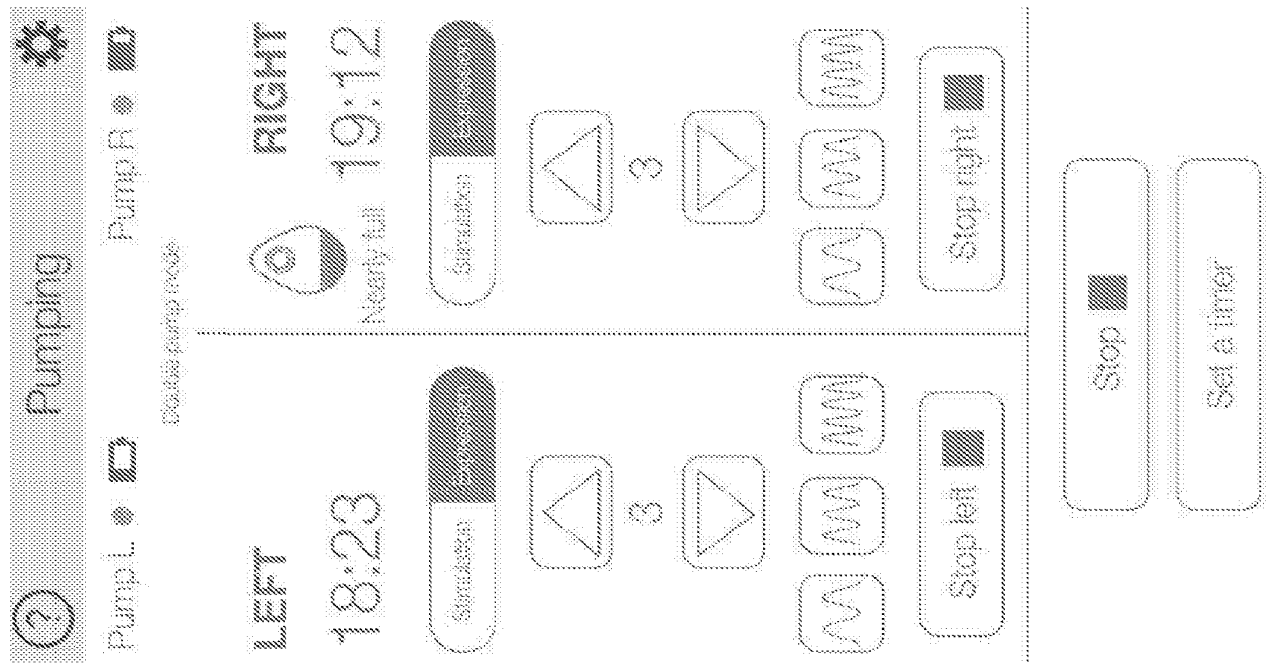


FIGURE 22



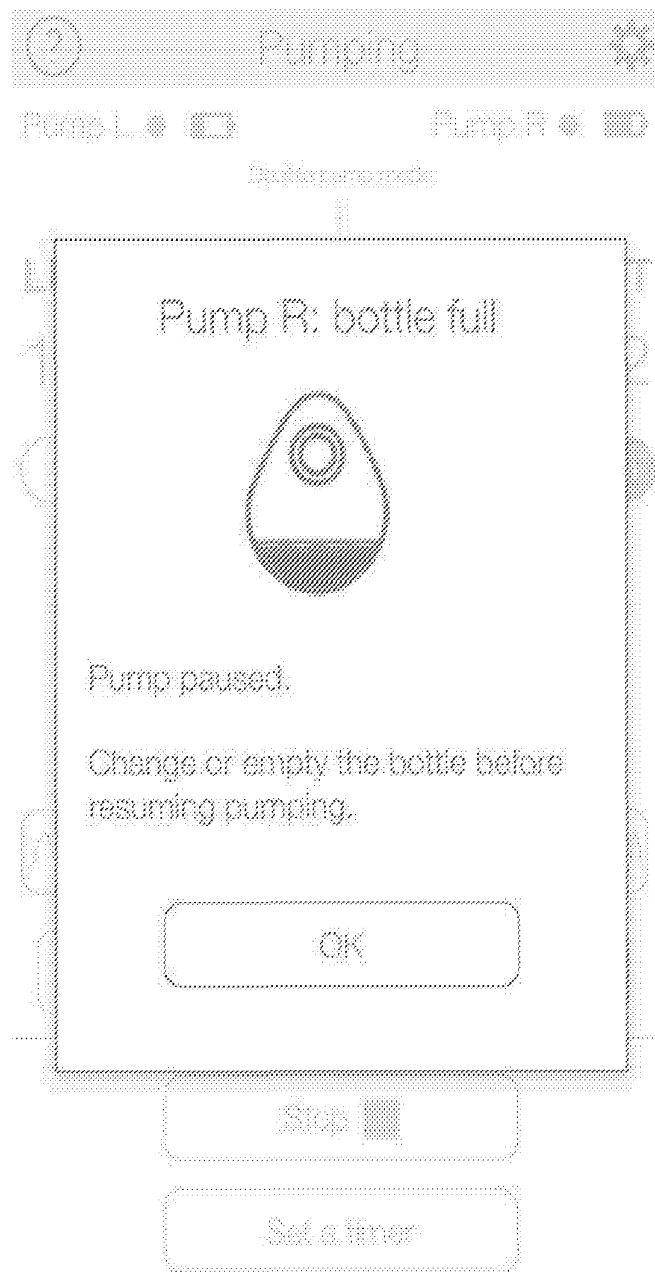


FIGURE 23

?

Stopped

⚙

Pump L ● 

Pump R ● 

Double pump mode

LEFT

21:02

STOPPED

Total volume in bottle:

60 ml

☐ Tick if you emptied or changed the bottle

Resume left 

RIGHT

20:38

STOPPED

Total volume in bottle:

65 ml

☐ Tick if you emptied or changed the bottle

Resume right 

Resume 

End session

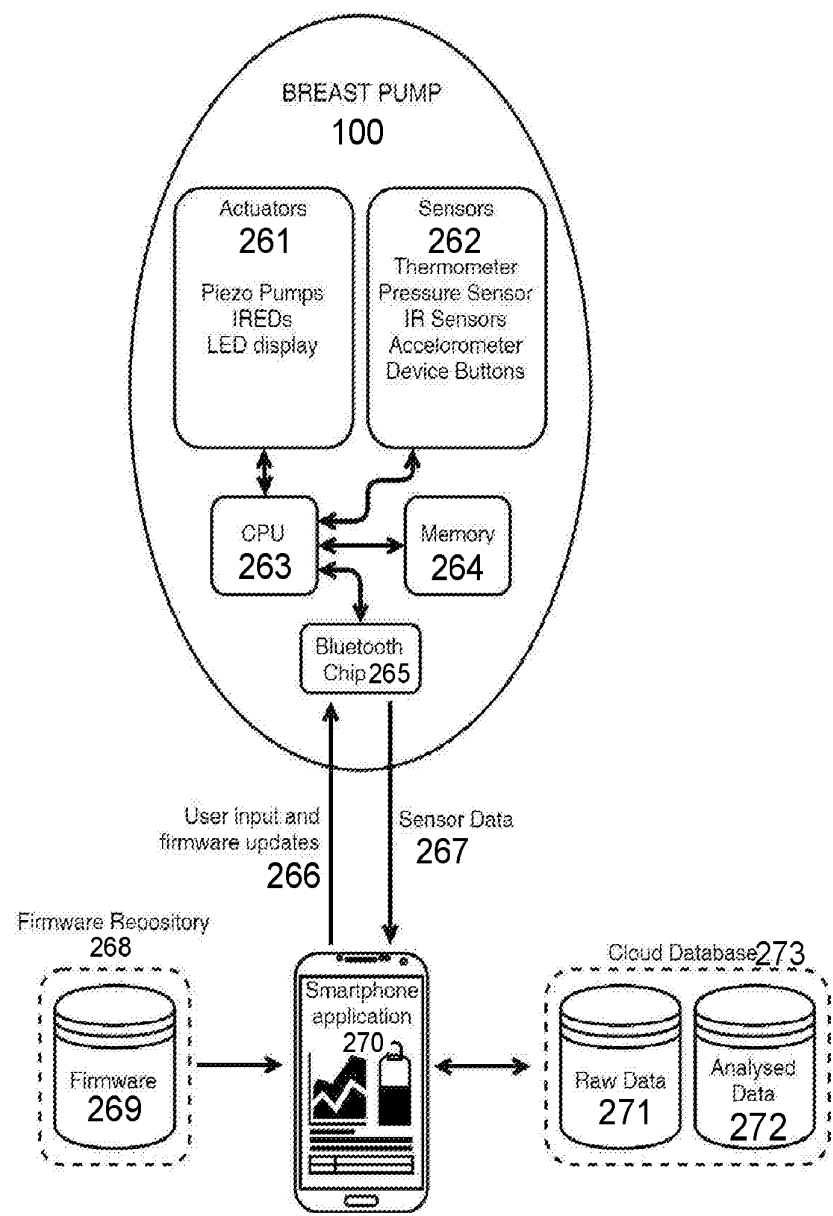
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FIGURE 24



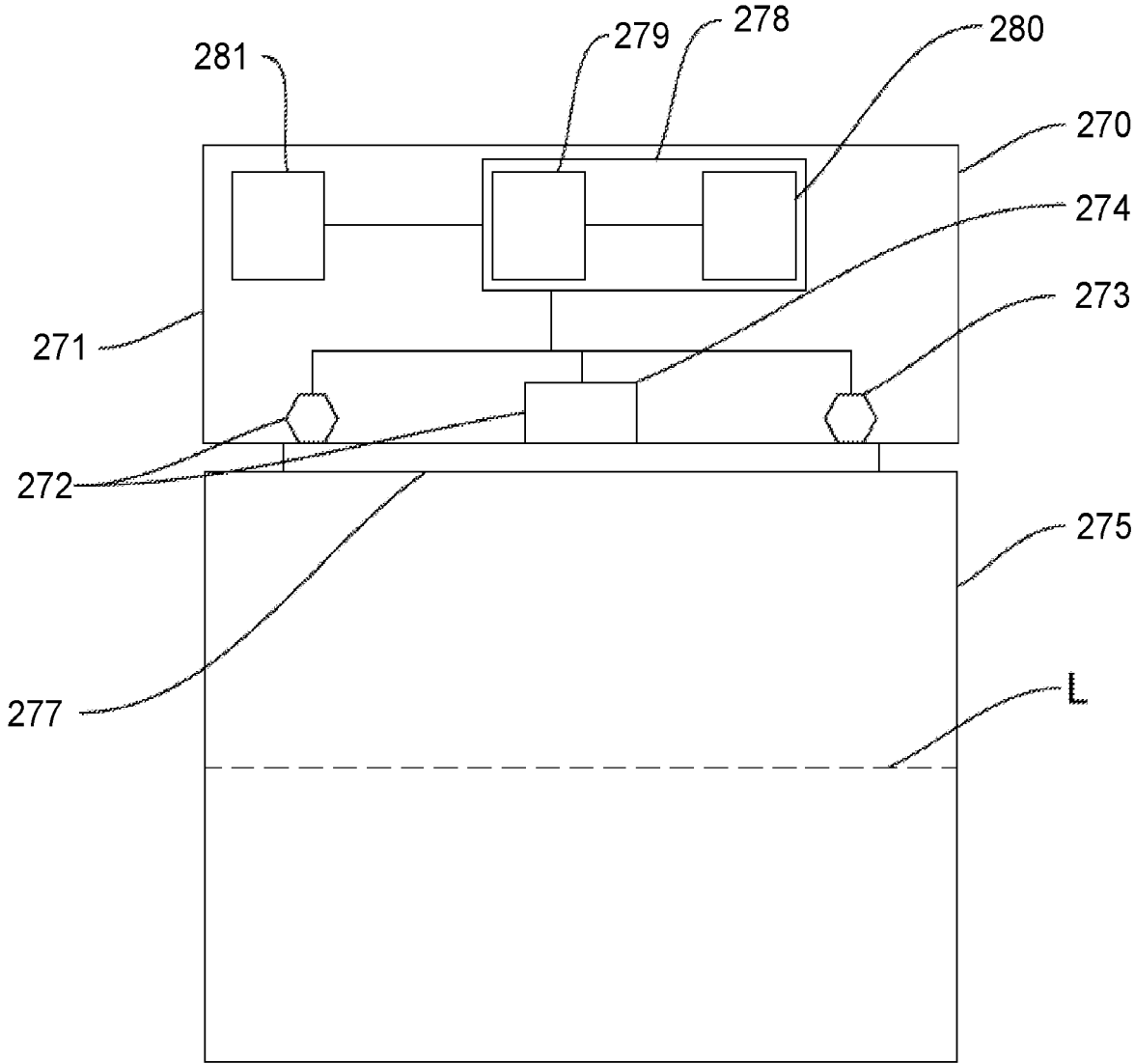
25/44

FIGURE 25



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FIGURE 26



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FIGURE 27

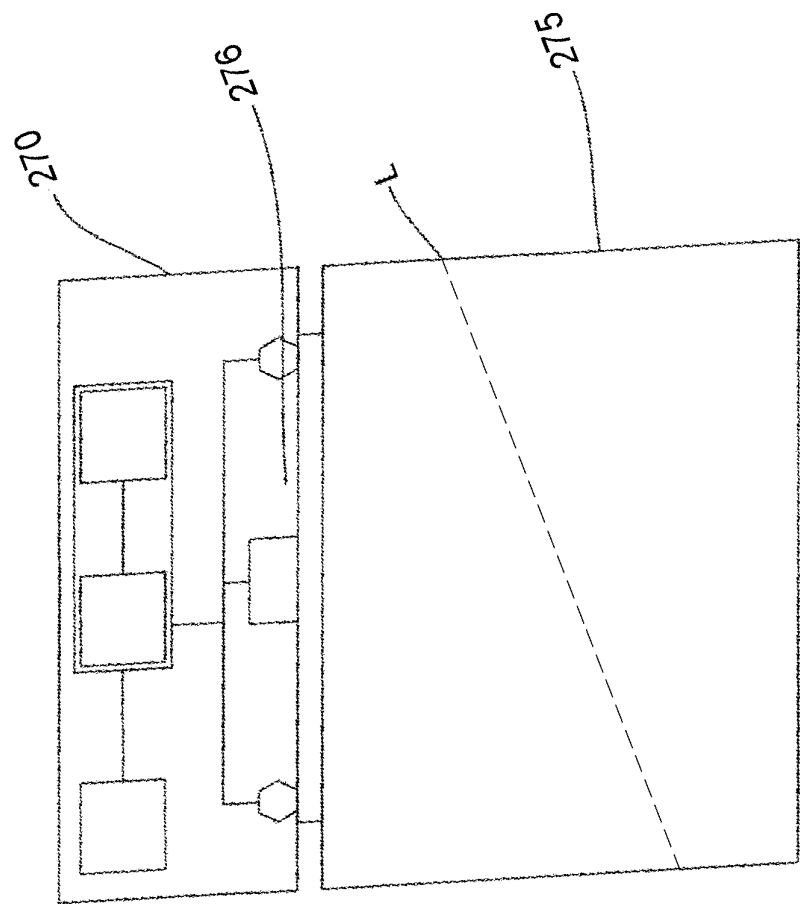


FIGURE 28

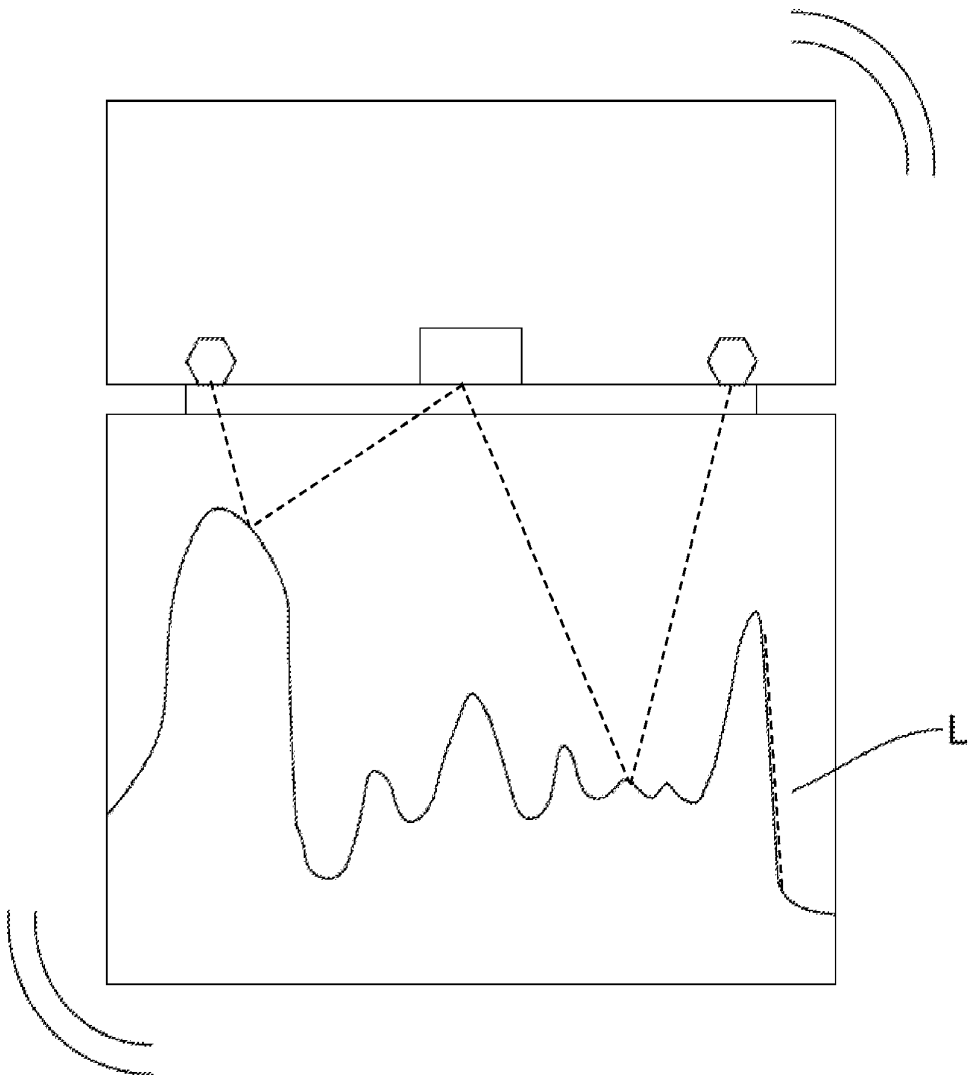


FIGURE 29

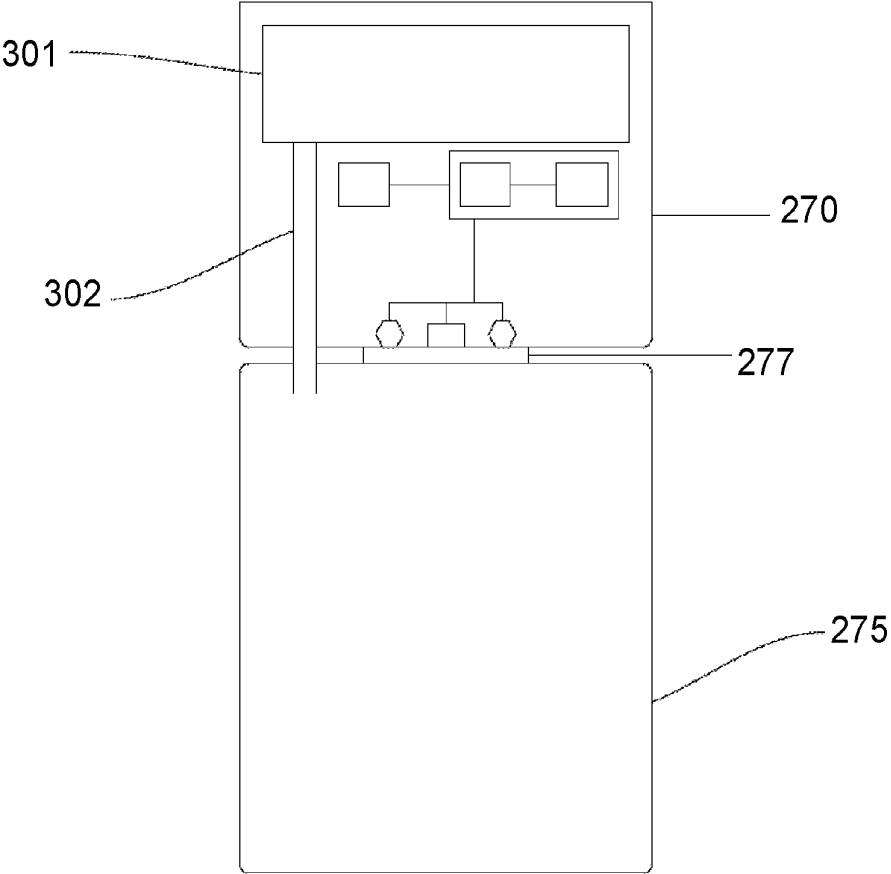


FIGURE 30



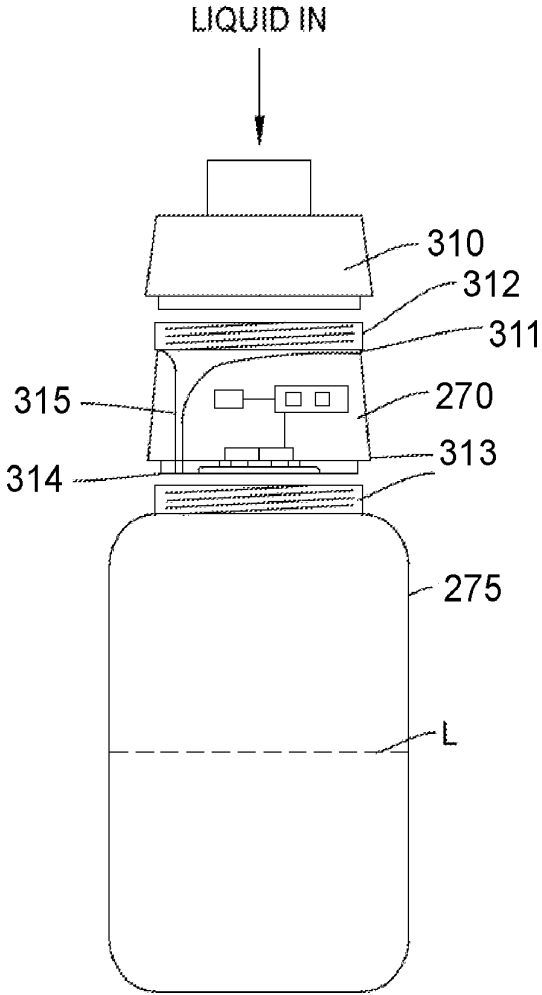
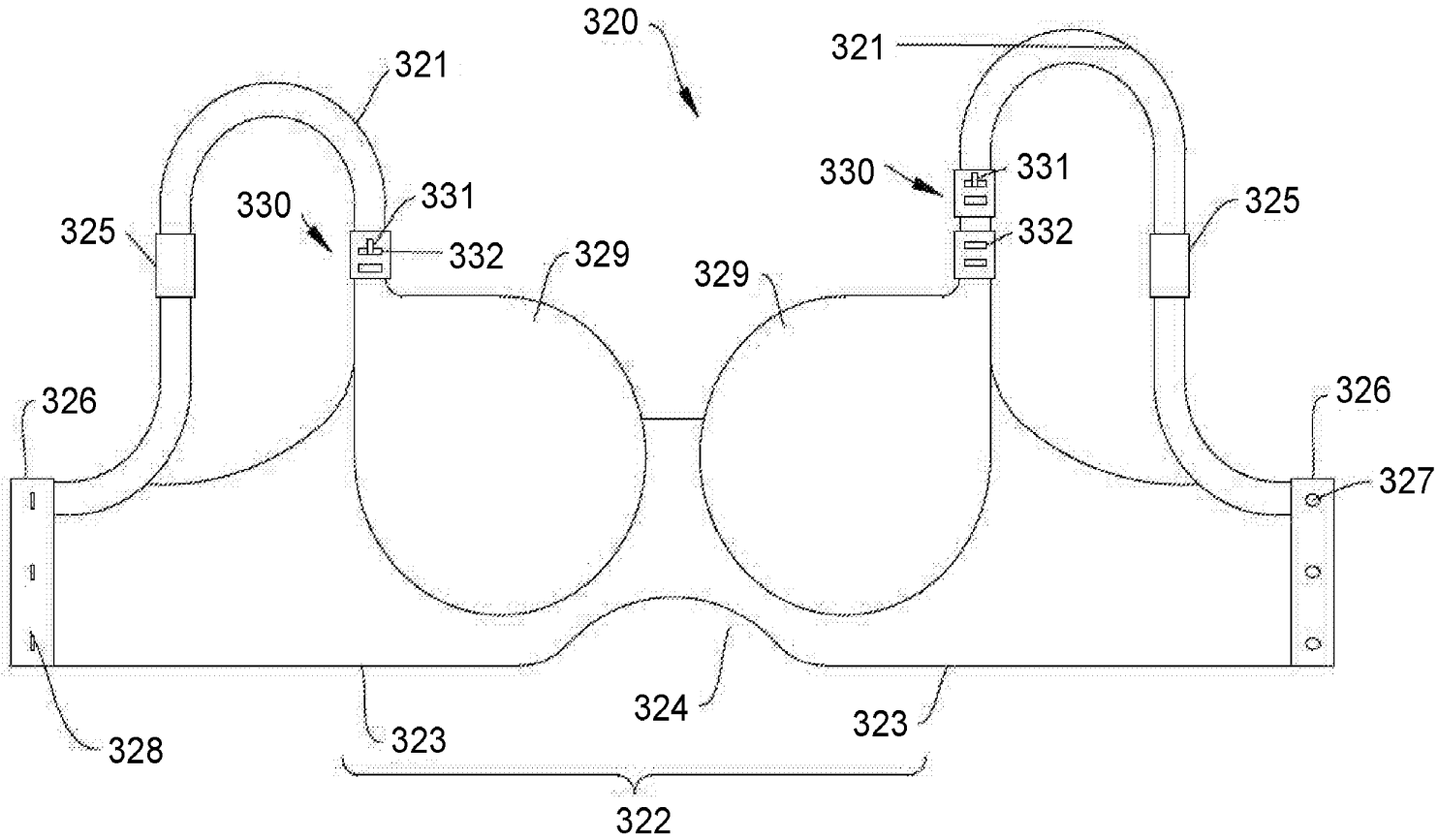


FIGURE 31



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FIGURE 32

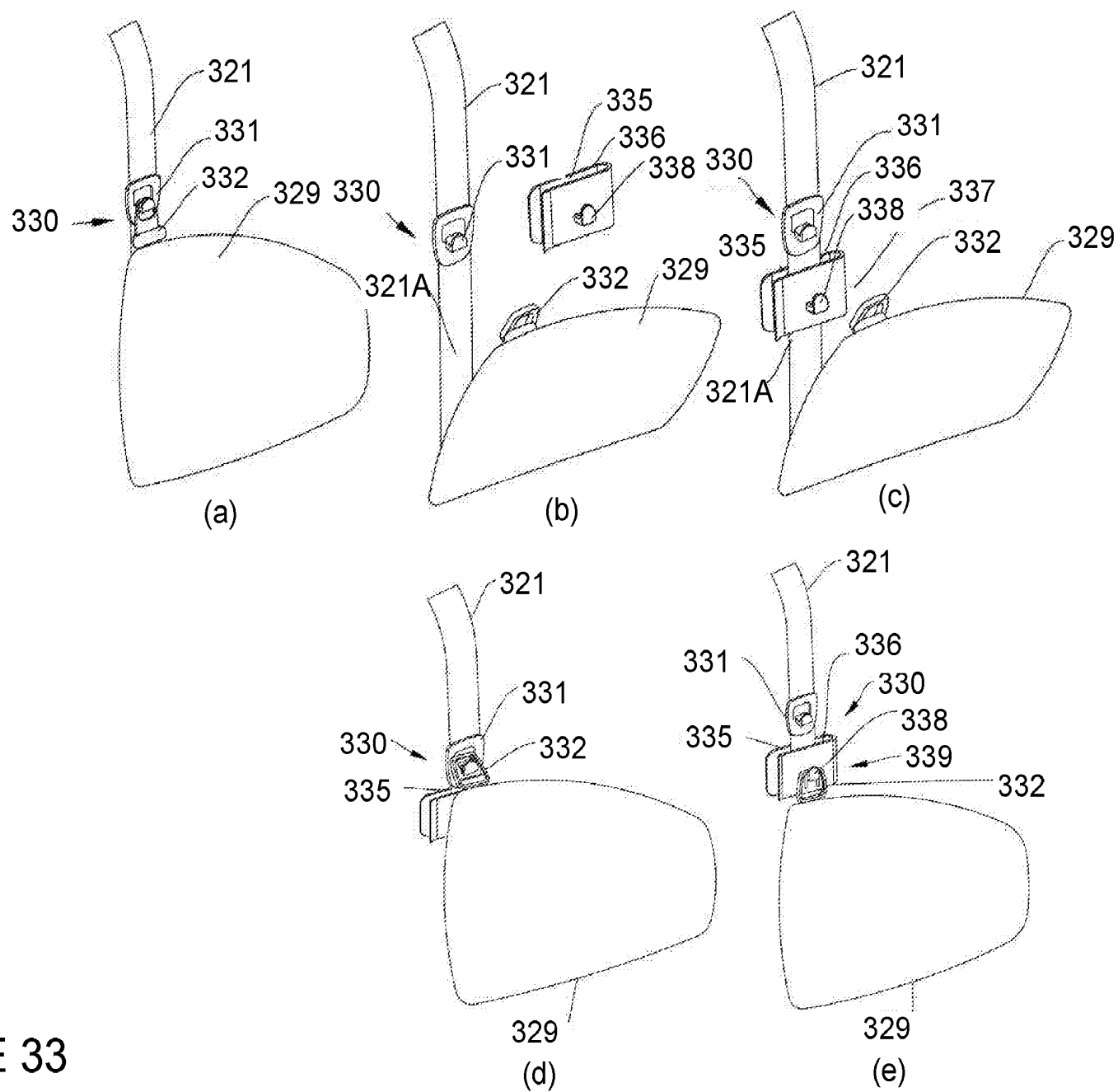


FIGURE 33

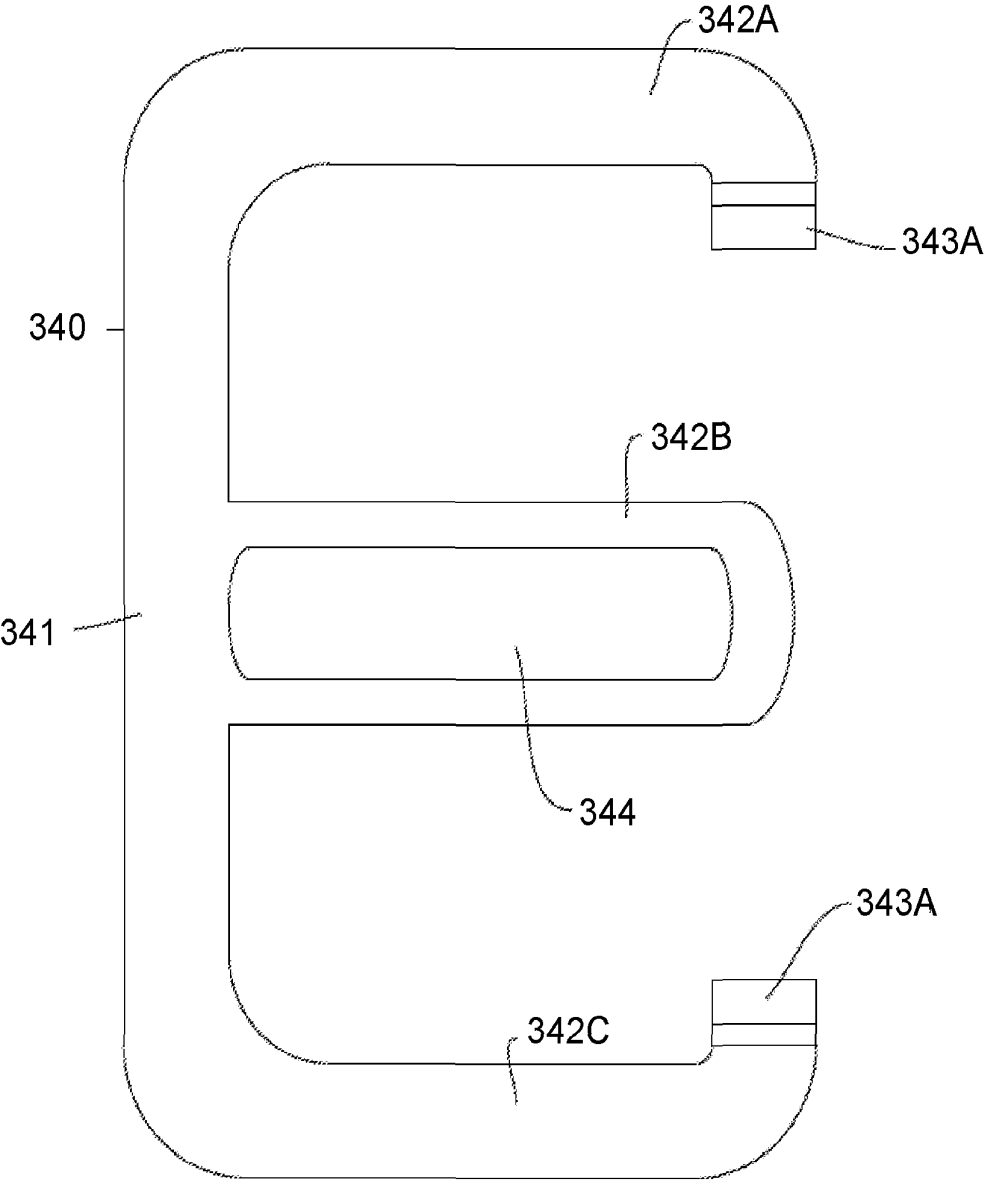


FIGURE 34

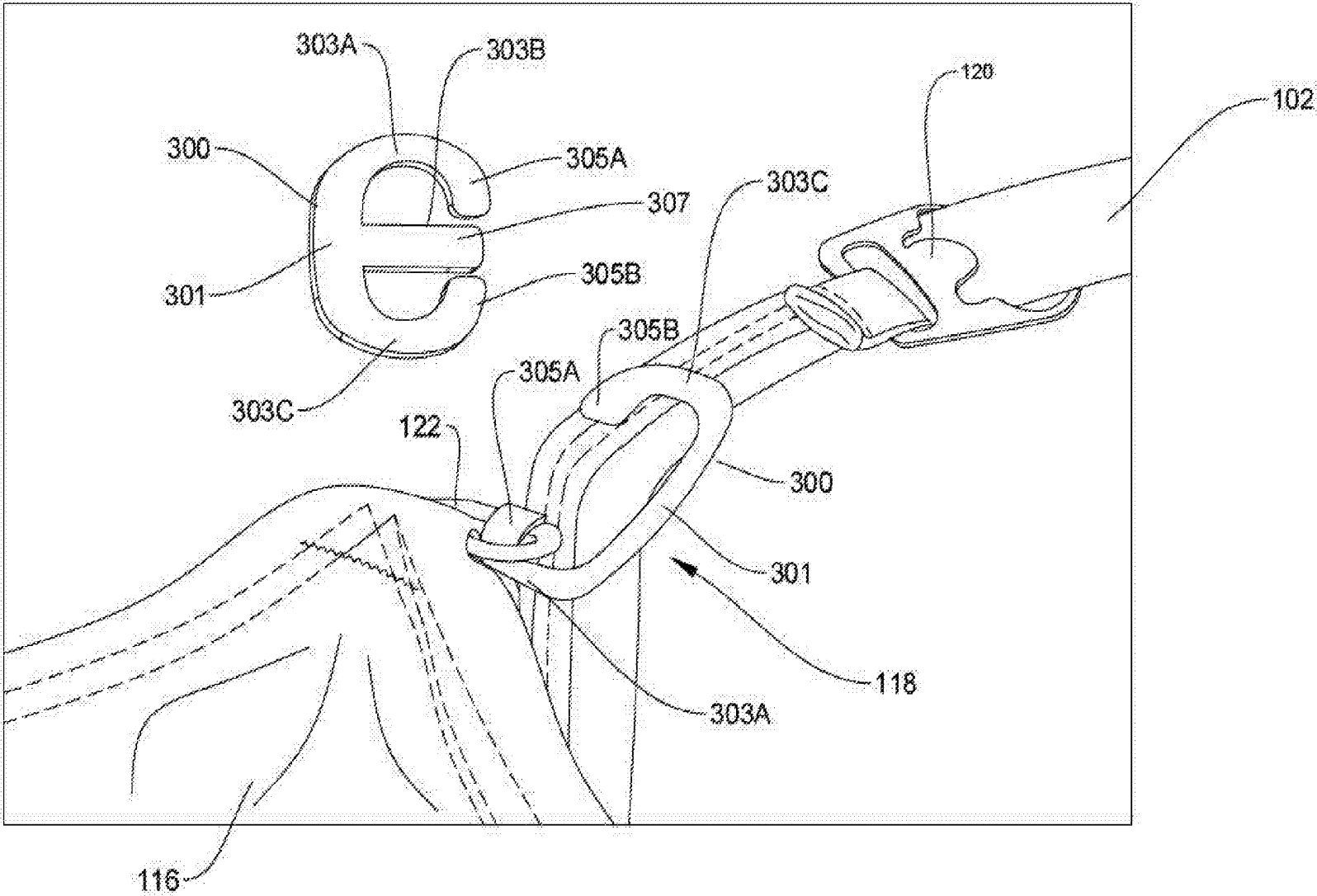
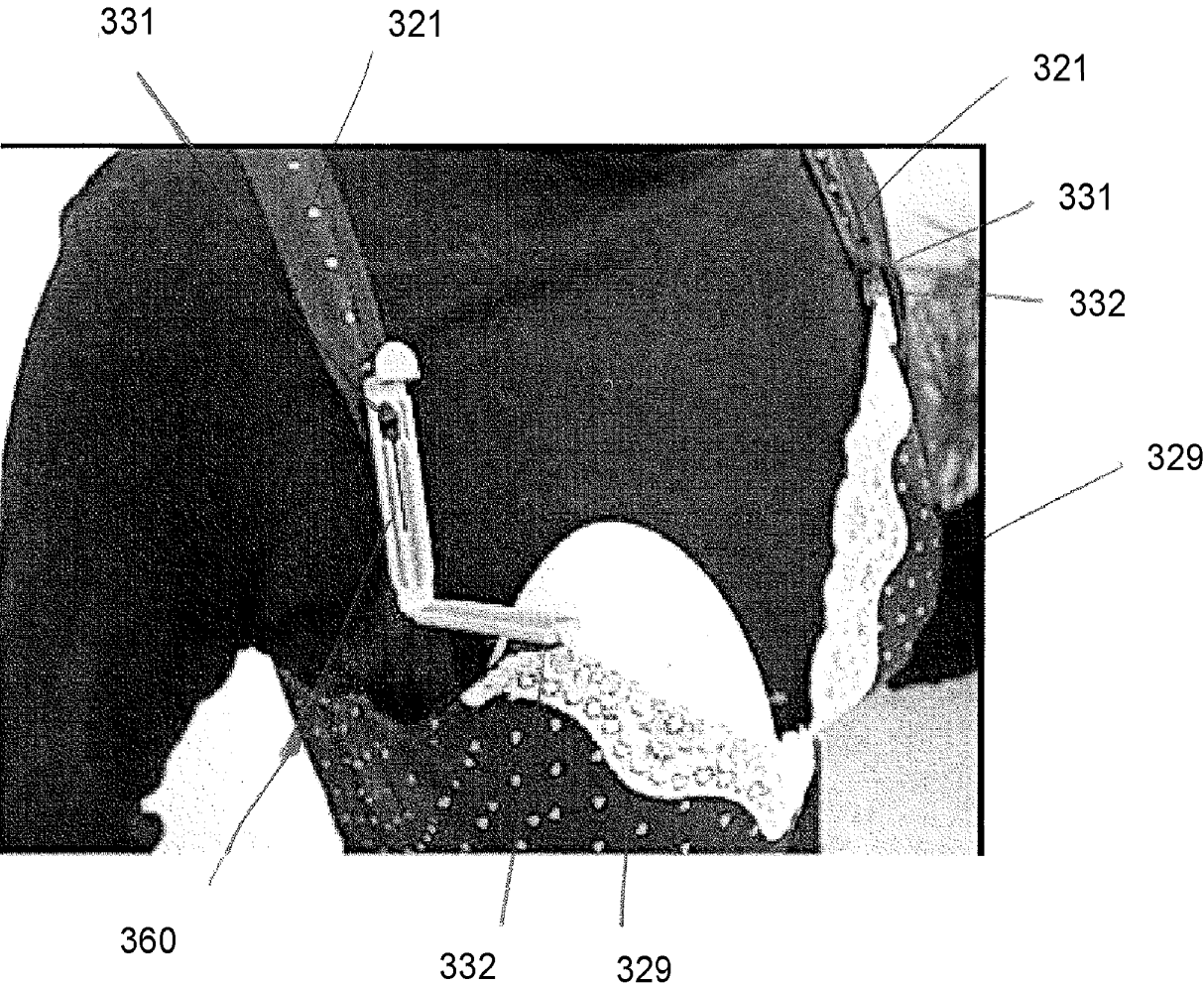


FIGURE 35



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FIGURE 36

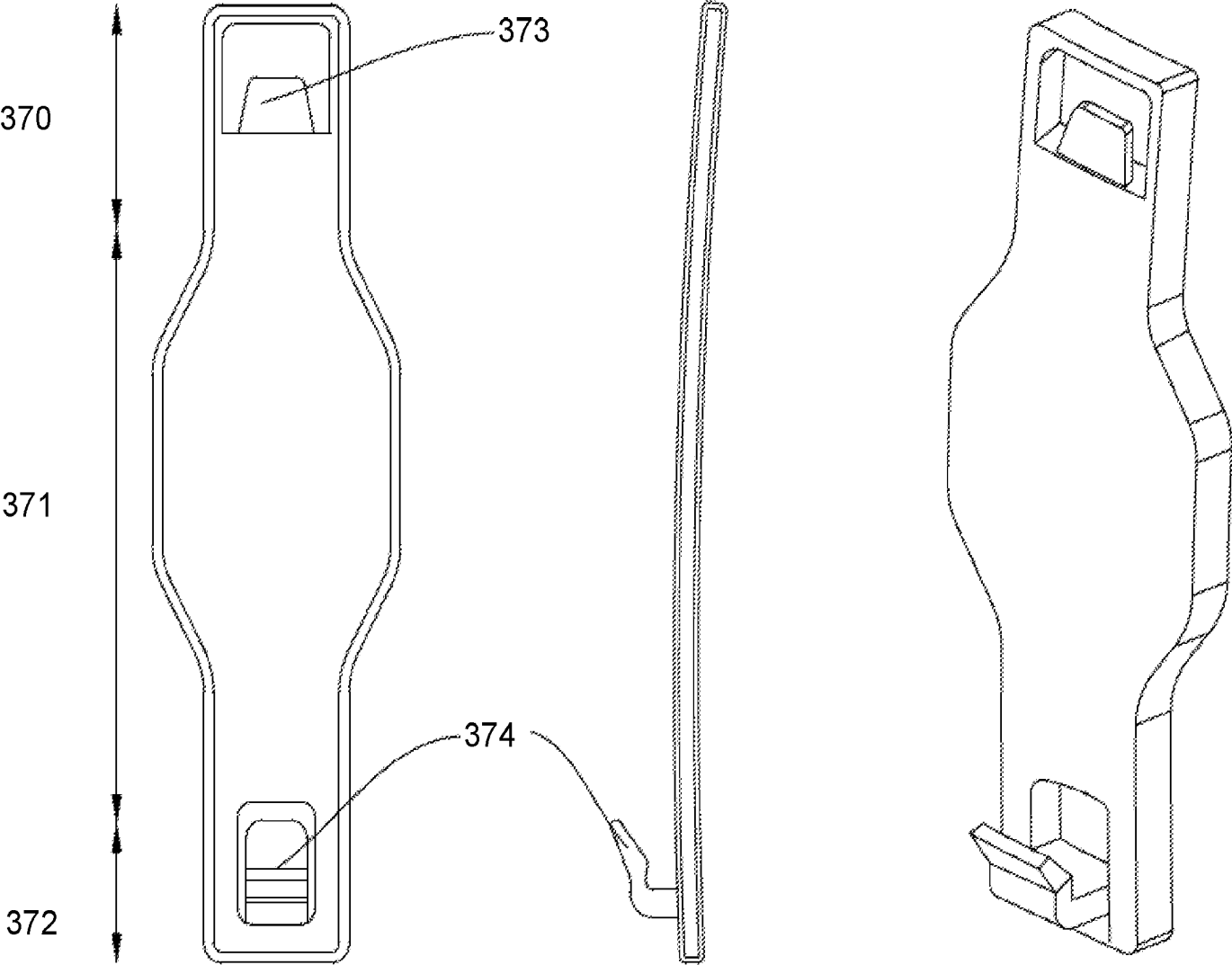


FIGURE 37

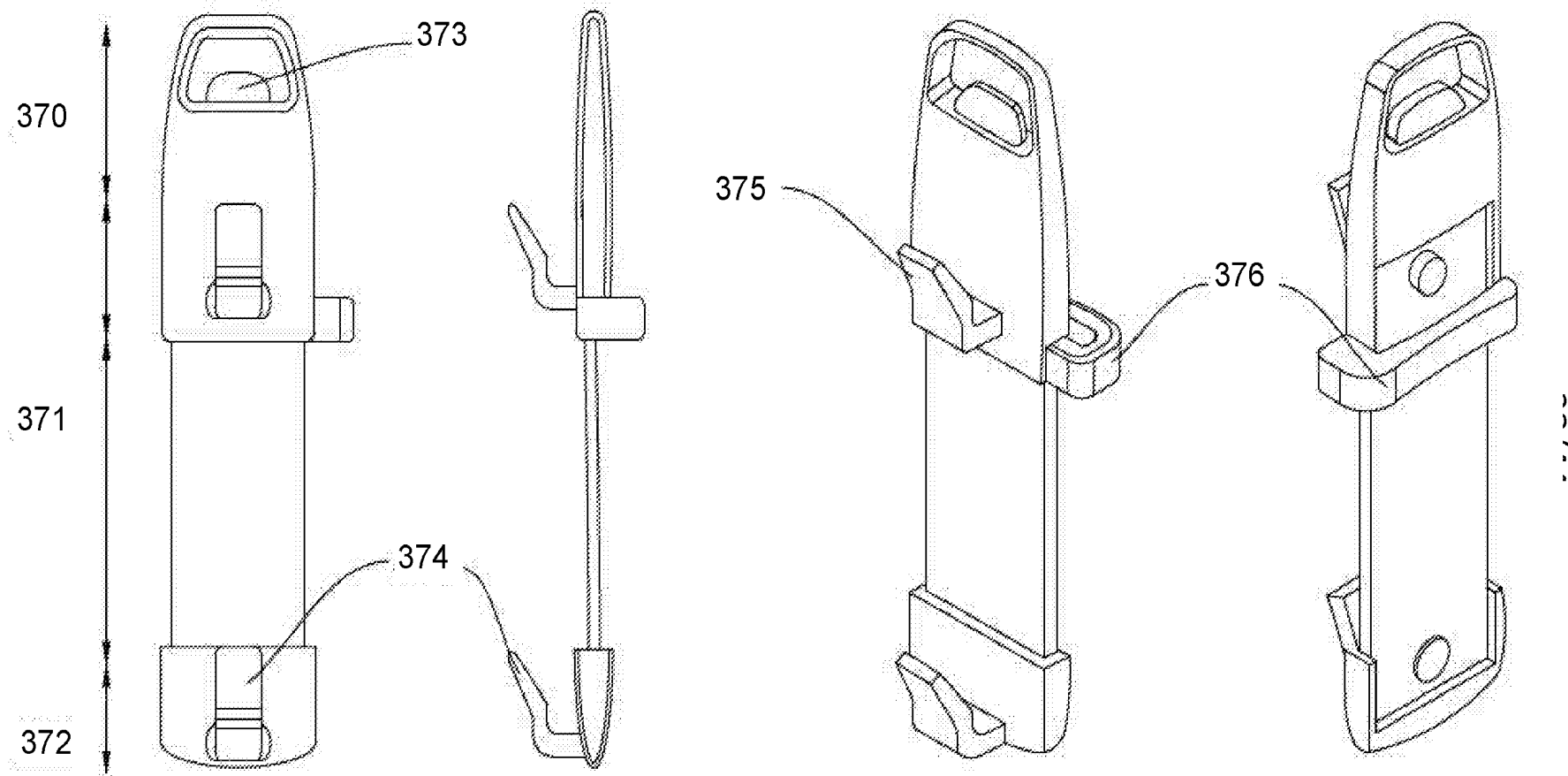


FIGURE 38



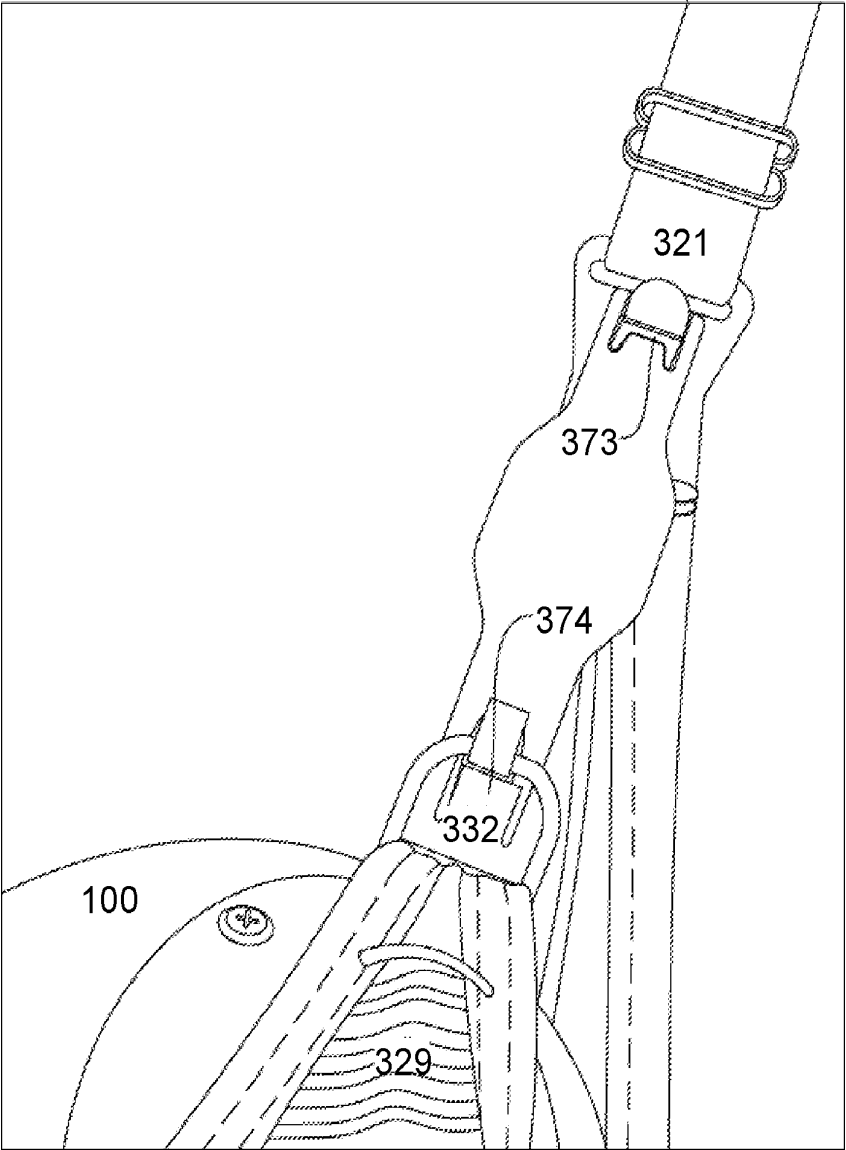
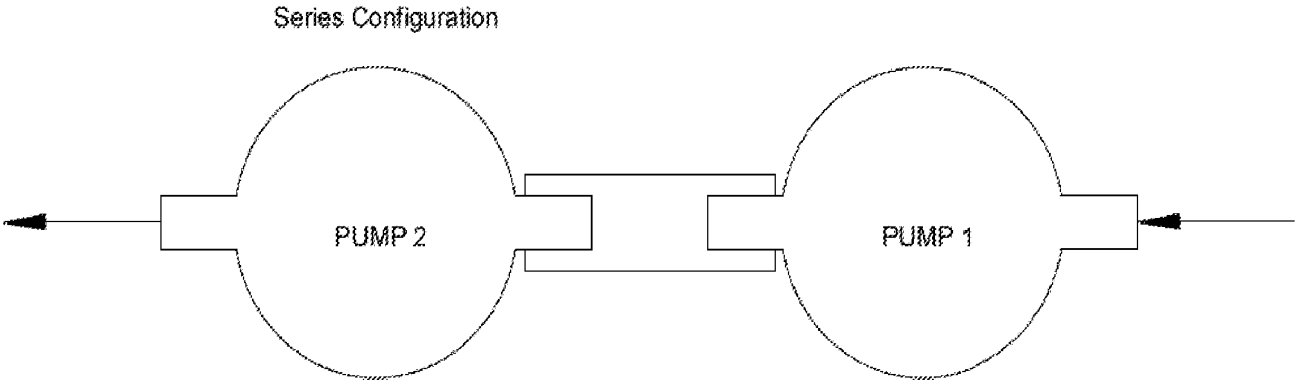


FIGURE 39



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FIGURE 40

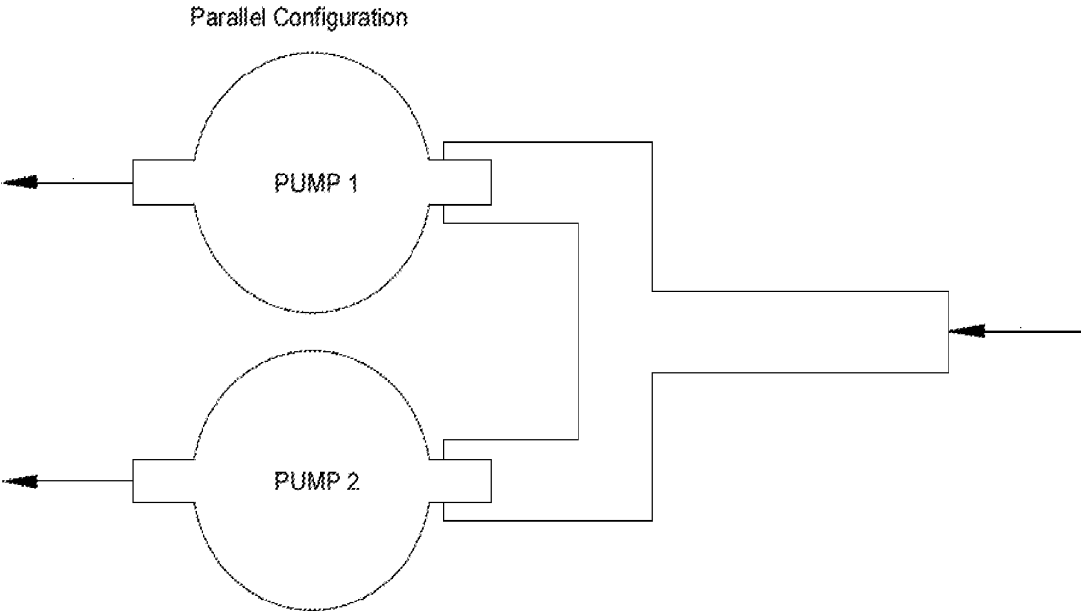


FIGURE 41

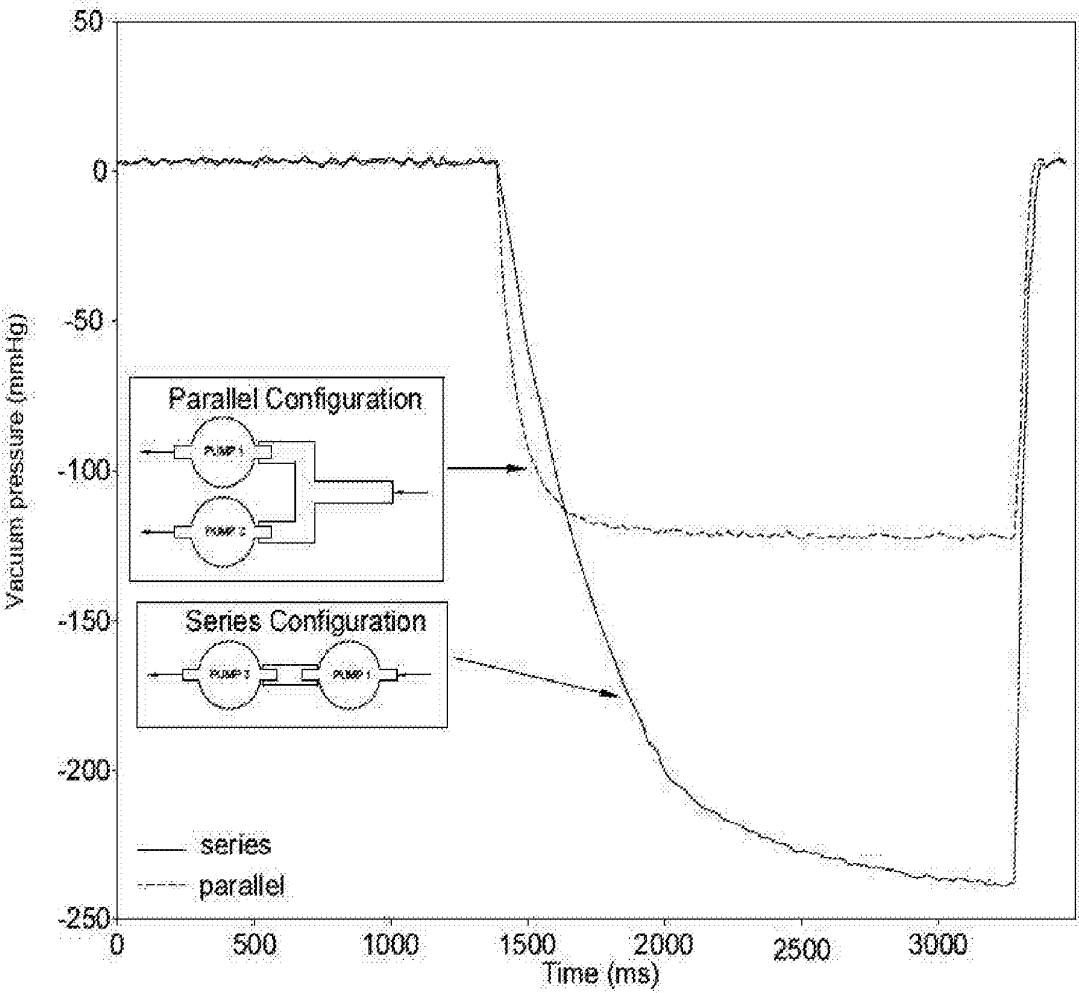


FIGURE 42

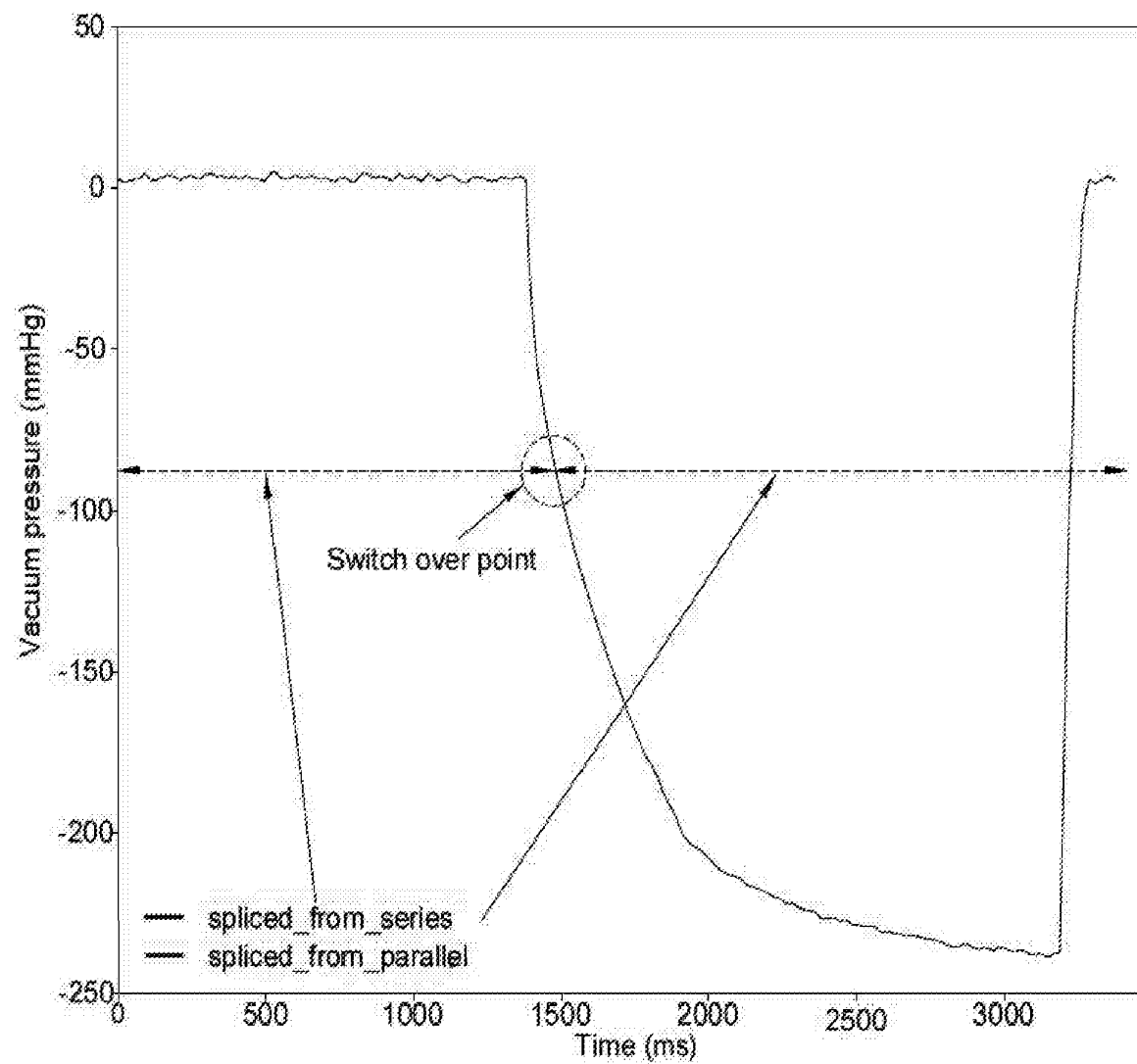


FIGURE 43

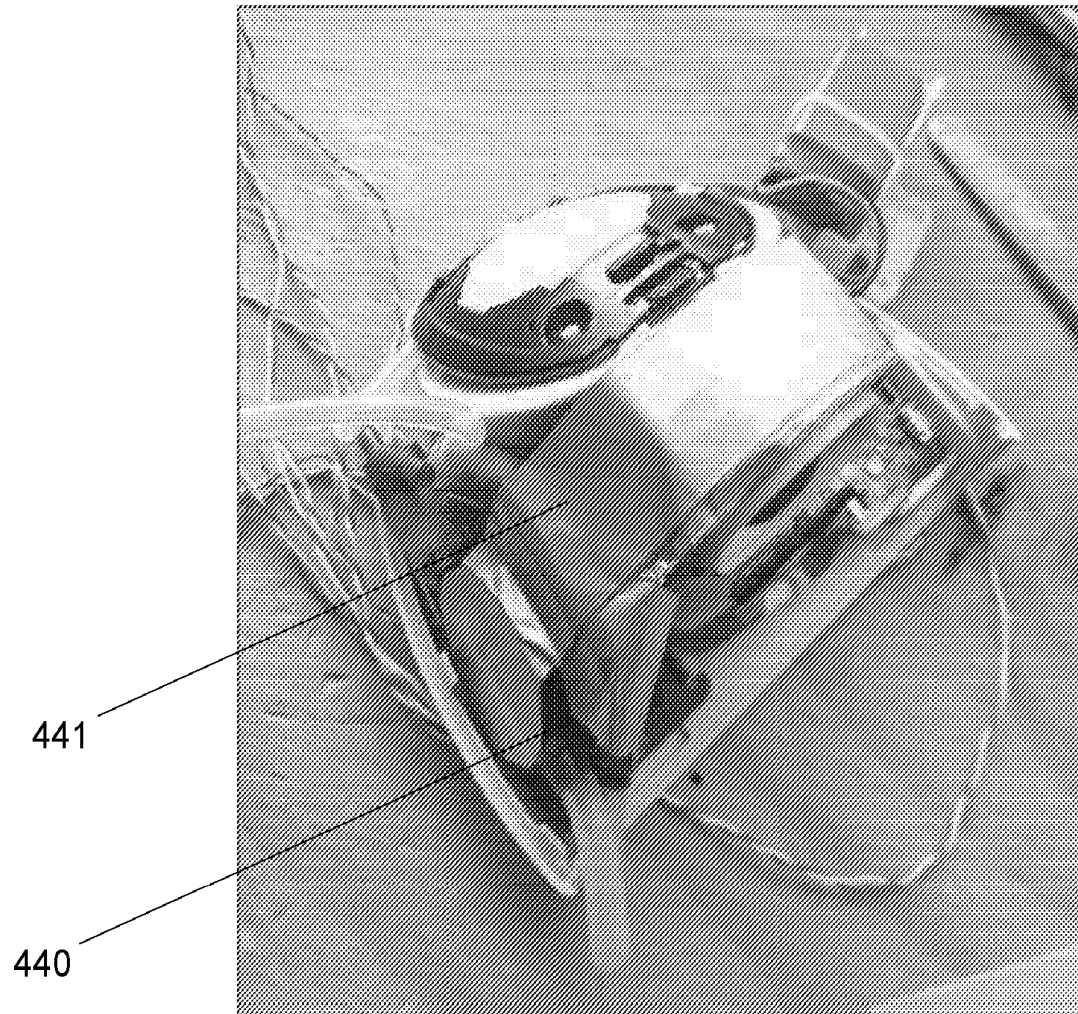


FIGURE 44



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Signed A HAYES

Dated 19 June 2017



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## Patents Form 1

Patents Act 1977 (Rule 12)

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Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

**Application number** GB 1709561.3

1. Your reference	<b>MJD/P153994GB00</b>		
2. Full name, address and postcode of the applicant or of each applicant	<b>CHIARO TECHNOLOGY LIMITED</b> <b>Second Floor 63-66 Hatton Garden</b> <b>London EC1N 8LE</b> <b>Greater London</b> <b>United Kingdom</b> <b>11287869002</b>		
Patents ADP number (if you know it)			
3. Title of the invention	<b>BRA CLIP</b>		
4. Name of your agent (if you have one)	<b>Boult Wade Tennant</b> <b>Boult Wade Tennant</b> <b>Verulam Gardens</b> <b>70, Gray's Inn Road</b> <b>London WC1X 8BT</b> <b>United Kingdom</b> <b>42001</b>		
"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)			
Patents ADP number (if you know it)			
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
Country	Application number	Date of filing	PDAS Access Code
6. Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application		Number of earlier UK application	Date of filing (day / month / year)
7. Inventorship: (Inventors must be individuals not companies)			
Are all the applicants named above also inventors?	<b>No</b>		
8. Are you paying the application fee with this form?	<b>Yes</b>		

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Continuation sheets of this form

Description: **9**

Claim(s): **3**

Abstract: **n/a**

Drawing(s): **7**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	PDAS Access Code
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10. If you are also filing any of the following, state how many against each item.

Priority documents: **0**

Statement of inventorship and right to grant of a patent  
(Patents Form 7): **1**

Request for search (Patents Form 9A): **1**

Request for a substantive examination (Patents Form 10): **0**

Any other documents (please specify): **PDAS Registration Form**

11. I/We request the grant of a patent on the basis of this application.

Signature: **/DRAPER, Martyn John/**

Date: **15 Jun 2017**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

**DRAPER, Mr Martyn**  
**Email: [boult@boult.com](mailto:boult@boult.com)**  
**Telephone: 020 7430 7500**  
**Fax: 020 7430 7600**

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**BRA CLIP****BACKGROUND**

Many specialised bras (or brassieres) exist for maternity that facilitate nursing and/or breast pumping for milk collection without the need to remove the bra itself. In a  
5 traditional nursing bra, this is achieved with the use of an at least partially detachable cup, which can be unhooked for feeding and/or pumping.

Further specialised bras are known which are provided with cut-out portions or slits which substantially align with the wearer's areola and nipple. Traditional breast pumps  
10 comprise an elongate breast shield which extends away from the breast towards an external bottle and source of suction. The breast shield is arranged to extend through the cut-out portion or slit, with the collection bottle and pumping apparatus connected thereto outside of the bra. These require the user to remove or unbutton any over-garments, and are uncomfortable for use when not pumping.

15

Integrated wearable breast pumps have begun to enter the market, such as US 2016 206794 A1. In such pumps, the suction source, power supply and milk container are locally provided, without the need for bulky external components or connections. Such devices can be provided with a substantially breast shaped profile so as to fit within a  
20 user's bra for discrete pumping, as well as pumping on-the-go without any tethers to electrical sockets or collection stations.

In US 2016 206794 A1, the applicant has appreciated that the added size of the breast pump means that the combination of the user's breast and the breast pump may no  
25 longer fit within the user's regular bra. This is particularly relevant as over-compression of the user's breast will result in the closing of the user's milk ducts and hence reduced expression. To address this, the breast pump of US 2016 206794 A1 has an offset shape favouring the lower half of the pump, and requires complex collapsible bag systems as milk collection devices. This is to force the pump to fit within the user's existing bras. This works  
30 by breast milk leaving the breast and enters the bag, and the breast shrinking in a corresponding volume to the expansion of the bag. The inventors consider that this is unlikely to be a perfect 1 to 1 transfer of volume, and hence the compression on the breast may increase as the collapsible bags fill.

P153994GB00

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In addition to these systems being particularly complex and wasteful, a relatively smaller bag must be used. In US 2016 206794, approximately 110 ml (4 fluid ounces) of milk can be collected before the bag must be changed. While this may be sufficient for some users, others may produce much more milk in a session. Additionally, even this small  
5 increase in cup size may make bras less comfortable for the user.

It is our understanding that in the product which has been brought to market based on the disclosure of US 2016 206794 does increase the effective cup size of the wearer by around 2 cup sizes based upon European standard EN 13402 which is discussed later.

10

Maternity (or nursing) bras such as disclosed in US 4,390,024 A have partially detachable cups, with a plurality of attaching means provided along the bra strap for attaching the cups to the strap. The cup can then be attached to different points in order to adjust the support provided. However, these attachment points are fixed. Additionally, this  
15 bra has been designed to accommodate the change in breast size before and after the feeding/pumping process. It is not designed to accommodate a breast pump.

Accordingly, there is a need for a better system to accommodate integrated wearable breast pumps.

20

#### SUMMARY OF THE INVENTION

A maternity bra system is provided according to the present invention comprising: a maternity bra comprising: a support structure comprising shoulder straps and a bra band; and a first and a second cup each attached to the support structure to provide a first cup  
25 size, at least one cup being at least partially detachable from the support structure at an attachment point, the system further comprising: a clip comprising a first engagement mechanism and at least one second engagement mechanism(s), the clip being attachable in a releasable manner to the support structure at a first position via the first engagement mechanism and attachable in a releasable manner to one of the partially detachable cups  
30 via the second engagement mechanism to provide a second cup size different to the first cup size.

This system allows a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast  
35 pump. As such, the user does not need a specialised adjustable bra; instead the present

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system works with all conventional maternity bras. The user also does not have to purchase any larger bras to wear while pumping.

5 The clip may be configured to be attached to the support structure at a position away from the attachment point. This results in the original attachment point being usable, with the clip providing an alternative attachment point for the adjusted cup size.

10 The clip may be attachable to the support structure at a plurality of non-discrete positions. This ensures essentially infinite adjustment of the clip position such that the perfect position for the user can be found.

15 The clip may be extendable between an unextended and an extended state, and attaches to the support structure at the attachment point; the first cup size is providable when the at least partially detachable cup is attached to the clip when the clip is an unextended state; the second cup size is providable when the at least partially detachable cup is attached to the clip when the clip is in an extended state.

An extendable clip like this allows quick switching between the two states in use.

20 Preferably, the attachment point is on at least one of the shoulder straps. Again this matches the standard system used in most maternity bras.

25 A clip is provided for use in the system described above according to the present invention. The clip comprising first and second engagement mechanisms and being releasably attachable to a support structure of a maternity bra with the first engagement mechanism and an at least partially detachable cup of a maternity bra with the second engagement mechanism to provide a second cup size which is different to a first cup size providable when the cup is attached to the support structure of the bra at an attachment point.

30

In a preferred embodiment, the first engagement mechanism engages with the support structure in a first direction and the second engagement mechanism engages with the cup in a second direction transverse to the first direction. This increases ease of attachment as with this structure the sideways engagement of the clip to the support

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structure ensures that the second attachment mechanism is correctly orientated for the cup.

5 The second engagement mechanism may be one or more of a hook or a snap or a clip. This ensures easy interfacing with the traditional hook and clasp systems already provided on maternity bras.

10 Preferably the clip further comprises two distinct second engagement mechanisms which can be used interchangeably dependent upon the orientation of the clip. This makes the clip easier to use as it can be quickly switched between each bra strap, and the user does not have to worry which way up to put the clip on.

15 Preferably, the clip comprises a material pathway with an opening for receiving a portion of the support structure as the first engagement mechanism for securing the clip to the bra. This ensures a quick and simple method for attaching the clip to the bra. In particular, the clip may substantially U-shaped, and the material pathway is between the arms of the U.

20 Preferably, the clip comprises three prongs extending from a central support, the three prongs arranged as a central prong and two outer prongs so as to receive the support structure on one side of the central prong and on the opposite side of each respective outer prong, at least one prong being provided with the second engagement mechanism. This ensures a strong attachment to the bra and a simple design.

25 Preferably, both outer prongs are each provided with a respective second engagement mechanism. This ensures that the clip is reversible for easier attachment to the bra.

30 A method of adjusting the cup size of a maternity bra is provided according to the present invention, comprising: providing a maternity bra comprising: a support structure comprising shoulder straps and a bra band; and a first and second cup each attached to the support structure to provide a first cup size, the at least one cup being detachable from the support structure at an attachment point, providing a clip comprising first and section engagement mechanisms, attaching the first engagement mechanism of the clip in a releasable manner to a first position of the support structure of the maternity bra, attaching one of the detachable cup to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size.

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This clip and method allow a user to quickly and simply adjust the cup size of a maternity bra to allow discrete and comfortable insertion and use of an integrated wearable breast pump.

5

Preferably, the method further comprises the step of inserting a breast pump into the detachable cup. The adjustment of the size of the bra allows the bra to support the breast pump against the user's breast for comfort and ease.

10

Preferably, the method further comprises the steps of: detaching the first engagement mechanism of the clip from the first position support structure of the maternity bra; attaching the first engagement mechanism of the clip in a releasable manner to a second position of the support structure of the maternity bra; and attaching the other of the detachable cups to the second engagement mechanism of the clip in a releasable manner to provide a second cup size different to the first cup size. This allows the user to use a single clip on either of the cups.

15

#### DESCRIPTION OF THE FIGURES

The following invention will be described with reference to the following Figures in which:

20

Figure 1 depicts a prior art design for a maternity bra;

Figures 2A and 2B depict a clip and clasp according to the present invention;

Figures 3A, 3B and 3C depict the clip of Figures 2A and 2B being fitted to a maternity bra according to the present invention;

Figures 4A and 4B depict adjustment of the maternity bra of Figures 3A, 3B and 3C according to the present invention;

25

Figure 5 depicts an alternative clip for adjustment of a maternity bra according to the present invention;

Figure 6 depicts the alternative clip of Figure 5; and

Figure 7 depicts an alternative clip for adjustment of a maternity bra according to the present invention.

30

#### DETAILED DESCRIPTION

As shown in Figure 1, a typical maternity bra 100 comprises a support structure made up of shoulder straps 102 which support the bra 100 on the wearer's shoulders, and a bra band 104 for extending around a user's ribcage, comprising two wings 106 and a

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central panel or bridge 108. The straps 102 are typically provided with adjustment mechanisms 103 for varying the length of the straps 102 to fit the bra 100 to the wearer.

At the outermost end of each wing, an attachment region 110 is provided. Typically, hooks 112 and loops 114 are provided for securing the bra 100 at the user's back. However, any other suitable attachment mechanism may be used. Alternatively, the attachment region 110 may be provided at the front of the bra 100 in the bridge region 108, with a continuous wing 106 extending continuously around the wearer's back. Typically, a number of sets of loops 114 are provided to allow for variation in the tightness of the bra 100 on the wearer.

While shown as having a separation in Figure 1, the wings 106 and bridge 108 may form a single continuous piece in certain designs. Likewise, while shown with a distinct separation in Figure 1, the shoulder straps 102 and the wings 106 may likewise form a single continuous piece.

The maternity bra 100 is further provided with two breast-supporting cups 116 attached to the support structure. The cups 116 define a cup size, which defines the difference in protrusion of the cups 116 from the band 104. The European standard EN 13402 for Cup Sizing defines cup sizes based upon the bust girth and the underbust girth of the wearer and ranges from AA to Z, with each letter increment denoting a 2 cm difference between the protrusion of the cups 116 from the band 104. Some manufacturers do vary from these conventions in denomination, and some maternity bras are measured in sizes of S, M, L, XL, etc.

The cups 116 may be stitched to the bra band 102. At least one of the cups 116, is in detachable attachment with the corresponding strap 102. In particular, this is achieved at attachment point 118 where a hook 120 attached to the bra strap 102 engages with a clasp 122 attached to the cup 116. The hook 120 and the bra strap adjuster 103 are set such that in the closed position, the cup size of the bra 100 fits the wearer's breasts. In Figure 1, the left cup 116 is shown attached to its attachment point 118, which the right cup 116 is unattached. In this manner, the wearer is able to detach the cup 116 to expose their breast for feeding or for breast pumping. Once this is completed, the cup 116 is reattached and the maternity bra 100 continues to function as a normal bra.



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While in the depicted embodiments, a hook 120 is shown on the bra strap 102 and a clasp 122 is shown on the cup 116, it is appreciated that the provision of these may be reversed, or that alternative attachment mechanisms may be used.

5 In other embodiments, the detachable attachment point 118 may be provided at a different location, such as at the attachment between the bra band 104 and the cup 116. The mechanism for such an attachment point is the same as described above.

10 Figure 2A and 2B depict a clip 200 according to the present invention, along with a clasp 122 shown in isolation from the bra cup 116 it is normally attached to. The clip 200 is provided with a material pathway 203 which receives a portion of the bra strap 102. In the particular embodiment of these Figures, the clip 200 is substantially U-shaped, with a narrowing profile towards its open end 202. However, it is appreciated that any other suitable shape with a material pathway may be used, such as an S-shape or E-shape. The clip 200 is designed to be attached to the bra strap 102 in a releasable manner, with the slot 203 acting as a support engaging mechanism. The releasable manner means that the clip 200 may be simply removed from the bra 100 without causing any damage to the functioning of the bra 100. To enhance the ease of attachment, the clip 200 may be provided with outwardly extending wings 204 which help direct the bra strap 102 into the clip 200. The clip 200 is further provided with a hook 220 acting as a cup engaging mechanism which can engage with the clasp 122.

25 Figures 3A, 3B and 3C show the clip 200 being attached to a bra strap 102 in order to provide a second attachment point 228 for the clasp 122 to attach to, and hence to provide a second cup size for the bra 100. In this particular embodiment, the clip 200 is attached in a portion of strap 102A below the original attachment point 118 and hence the second attachment point 228 is likewise below the original attachment point. This results in a second cup size larger than the first cup size. In preferred embodiments, as shown in these Figures, the clip 200 engages with the support structure in a direction transverse to the direction in which it engages with the cup.

35 Figures 4A and 4B show how a wearer is able to move between the first and second cup sizes. In Figure 4A, the cup 116 is attached at the first attachment point 118 to provide a first cup size. The wearer then disengages the clasp 122 from the hook 120 at the first engagement point 118. As shown in Figure 4B, the clasp 122 is then engaged with

the hook 220 at the second engagement point 218. In this manner, the wearer is easily able to transition between the two cup sizes.

Figures 5 and 6 show an alternative design for a clip 300. This clip 300 is substantially "E-shaped", with a back portion 301 and first, second and third prongs 303A, 303B, 303C extending transverse from this back portion 301. The three prongs 303A, 303B, 303C are spaced apart along the length of the back portion 301. The first and third prongs 303A, 303C are provided with attachment clips 305A, 305B.

These attachment clips 305A, 305B are engageable with the clasp 122 of a bra to provide the second cup size. Depending upon the orientation of the clip 300, one or the other of the attachment clips 305A, 305B will be used to attach the clasp 122 of the bra. By providing these clips 305A, 305B on both of the first and the third prongs 303A, 303C the clip is easily reversible so it can be used on either side of the bra. Preferably the clip 300 is also symmetrical, to aid the reversibility of the clip 300.

Figure 6 shows the clip 300 attached to a bra. As can be seen, the first and third prongs 303A, 303C extend on the front side of the bra strap, with the second prong 303B extending on the rear side of the bra strap. In this manner, the clip 300 is attached to the strap. In preferably embodiments, a grip-enhancing member 307 such as a number of projections and/or roughened patches can be provided on the second prong 303B in order to strengthen this grip.

In alternative embodiments, the attachment clip could be provided on the second, centremost prong 303B. In such an arrangement, the centremost prong 303B would be on the outside of the bra, with the first and third prongs 303A, 303C on the inside.

The provision of the attachable clip allows maternity bras already owned by the wearer to be quickly transformed into bras with quick switchable double cup size options. This allows the use of integrated wearable breast pumps which increase the user's cup size. This allows more design freedom for the breast pump in terms of size and shape, while still allowing the user to discretely pump with the pump held within their bra. By allowing conversion of the user's existing maternity bras, they are not forced to purchase specially designed bras to wear with the pump. As such, the present invention allows a

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user to discretely switch between the two configurations, and insert the pump without any complex adjustment or removal of clothing.

5 Preferably, the clip will be relatively unobtrusive in size and shape and hence can be left in place when the bra is first put on and used when necessary. To this end, the clip is preferably machine washable without significant damage or degradation.

10 In some embodiments, the clip may be switchable between positions for engaging with each cup so that a single clip may be used on either side of the bra. To achieve this, the clip is preferably reversible. This may provide the user with a visual indication of which breast has produced milk most recently so switching can take place.

15 An alternative embodiment may be provided, with an extendable clip as shown in Figure 7. In such an embodiment the clip is attached to the hook 120 on the strap 102 in a releasable manner, with the clasp 122 attached to an expandable portion of the clip. The clip is then able to expand between an unexpanded state where the clasp 122 is held in substantially the same position as the first attachment point 118 to provide the first cup size, and an expanded state, where the clasp 122 is held in a second position away from the first attachment point 118 to provide the second cup size.

20 For example, an elongate clip with first and second opposite ends may be provided. A first attachment point for attaching to the hook 120 is provided at the first end, and a second attachment point for attaching to the clasp 122 is provided at the second end. The elongate clip is hinged between the two ends, such that the clip can be folded between an elongate configuration to a closed configuration where the second end touches the first end. A clasp can be provided on the clip to hold the second end in this closed configuration. Thus, in the closed position the clasp 122 is held in substantially the same location as the first attachment point 118 to provide the first cup size, and in the open position the clasp is held away from the first attachment point 118 to provide the second cup size.

30 Other extendable clip embodiments are also possible, for example sliding clips or elastic clips.

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## CLAIMS:

1. A maternity bra system comprising:

a maternity bra comprising:

a support structure comprising shoulder straps and a bra band; and

5 a first and a second cup each attached to the support structure to provide a first cup size, at least one cup being detachable from the support structure at an attachment point,

the system further comprising:

10 a clip comprising a first engagement mechanism and at least one second engagement mechanism(s), the clip being attachable in a releasable manner to the support structure at a first position via the first engagement mechanism and attachable in a releasable manner to one of the detachable cups via the second engagement mechanism to provide a second cup size different to the first cup size.

15 2. The maternity bra system of claim 1, wherein the clip is configured to be attached to the support structure at a position away from the attachment point.

3. The maternity bra system of claim 2, wherein the clip is attachable to the support structure at a plurality of non-discrete positions.

20

4. The maternity bra system of claim 1, wherein:

the clip is extendable between an unextended and an extended state, and attaches to the support structure at the attachment point;

25 the first cup size is providable when the at least partially detachable cup is attached to the clip when the clip is an unextended state;

the second cup size is providable when the at least partially detachable cup is attached to the clip when the clip is in an extended state.

30 5. The maternity bra system of any preceding claim, wherein the attachment point is on at least one of the shoulder straps.

6. The maternity bra system of any preceding claim, wherein the second cup size is larger than the first cup size.

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7. A clip for use in a system according to any preceding claim, the clip comprising first and second engagement mechanisms and being attachable in a releasable manner to a support structure of a maternity bra with the first engagement mechanism and an at least partially detachable cup of a maternity bra with the second engagement mechanism to provide a second cup size which is different to a first cup size providable when the cup is attached to the support structure of the bra at an attachment point.

8. The maternity bra system or clip of any preceding claim, wherein the first engagement mechanism engages with the support structure in a first direction and the second engagement mechanism engages with the cup in a second direction transverse to the first direction.

9. The maternity bra system or clip of any preceding claim, wherein the second engagement mechanism is one or more of a hook or a snap or a clip.

10. The maternity bra system or clip of any preceding claim, wherein the clip further comprises two distinct second engagement mechanisms which can be used interchangeably dependent upon the orientation of the clip.

11. The maternity bra system or clip of any preceding claim, wherein the clip comprises a material pathway with an opening for receiving a portion of the support structure as the first engagement mechanism for securing the clip to the bra.

12. The maternity bra system or clip of claim 11, wherein the clip is substantially U-shaped, and the material pathway is between the arms of the U.

13. The maternity bra system or clip of any of claims 1 to 11, wherein the clip comprises three prongs extending from a central support, the three prongs arranged as a central prong and two outer prongs so as to receive the support structure on one side of the central prong and on the opposite side of each respective outer prong, at least one prong being provided with the second engagement mechanism.

14. The maternity bra system or clip of claim 13, wherein both outer prongs are each provided with a respective second engagement mechanism.

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15. A method of adjusting the cup size of a maternity bra, comprising:  
providing a maternity bra comprising:

a support structure comprising shoulder straps and a bra band; and

a first and second cup each attached to the support structure to provide a

5 first cup size, at least one cup being detachable from the support structure at an  
attachment point,

providing a clip comprising first and second engagement mechanisms;

attaching the first engagement mechanism of the clip in a releasable manner to a  
first position of the support structure of the maternity bra;

10 attaching one of the detachable cups to the second engagement mechanism of the  
clip in a releasable manner to provide a second cup size different to the first cup size.

16. The method of claim 15, further comprising the step of inserting a breast pump into  
the one of the detachable cup.

15

17. The method of claim 15 or 16, further comprising the steps of:

detaching the first engagement mechanism of the clip from the first position support  
structure of the maternity bra;

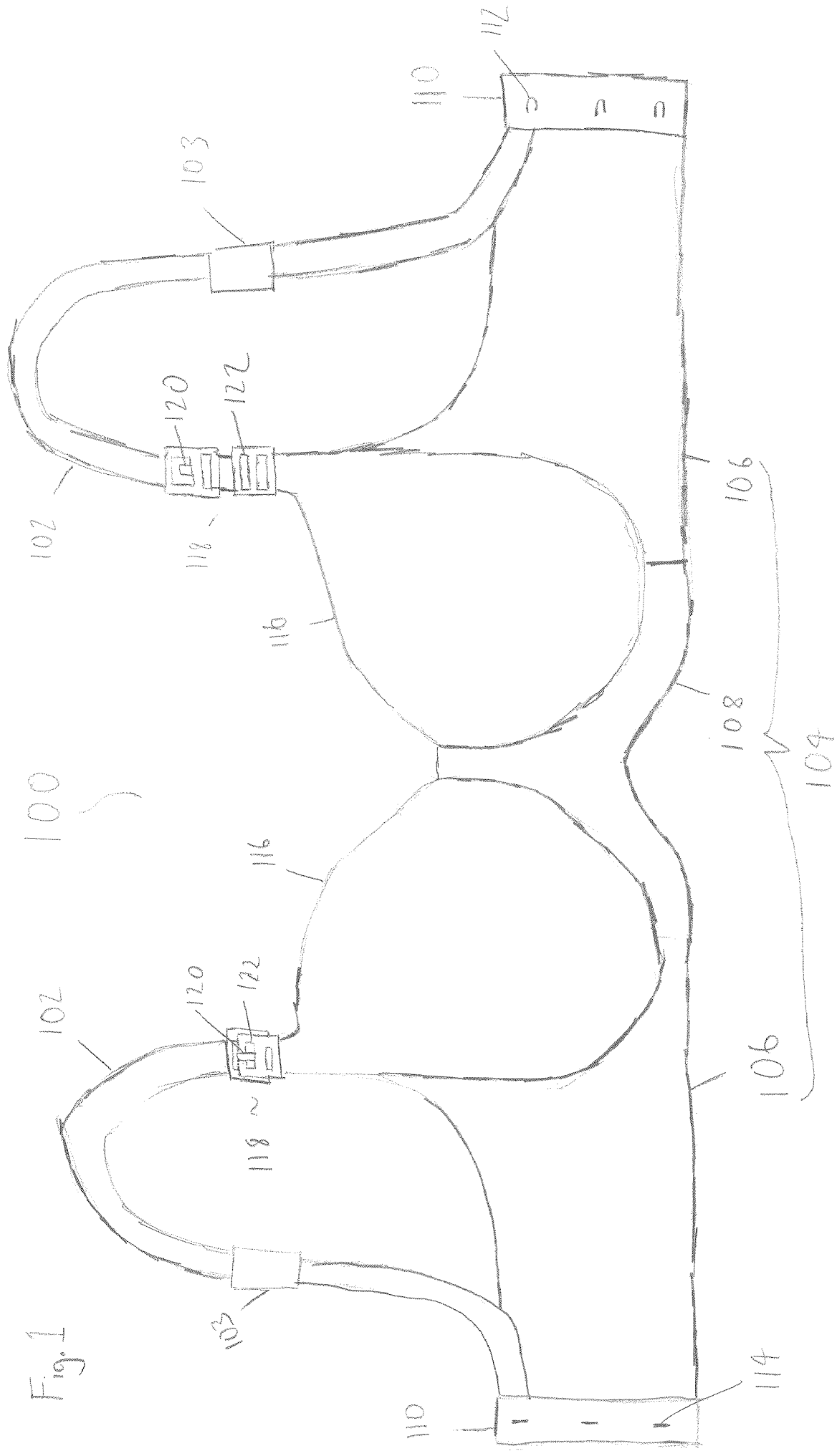
attaching the first engagement mechanism of the clip in a releasable manner to a

20 second position of the support structure of the maternity bra; and

attaching the other of the detachable cups to the second engagement mechanism  
of the clip in a releasable manner to provide a second cup size different to the first cup  
size.

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Fig. 1



PRIOR ART

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Fig. 2A

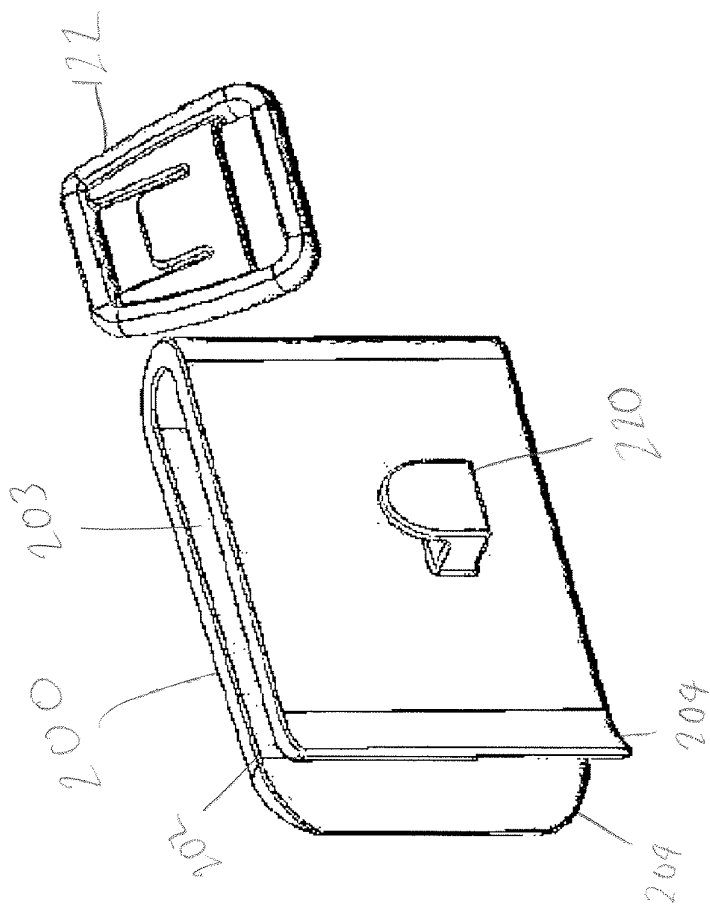
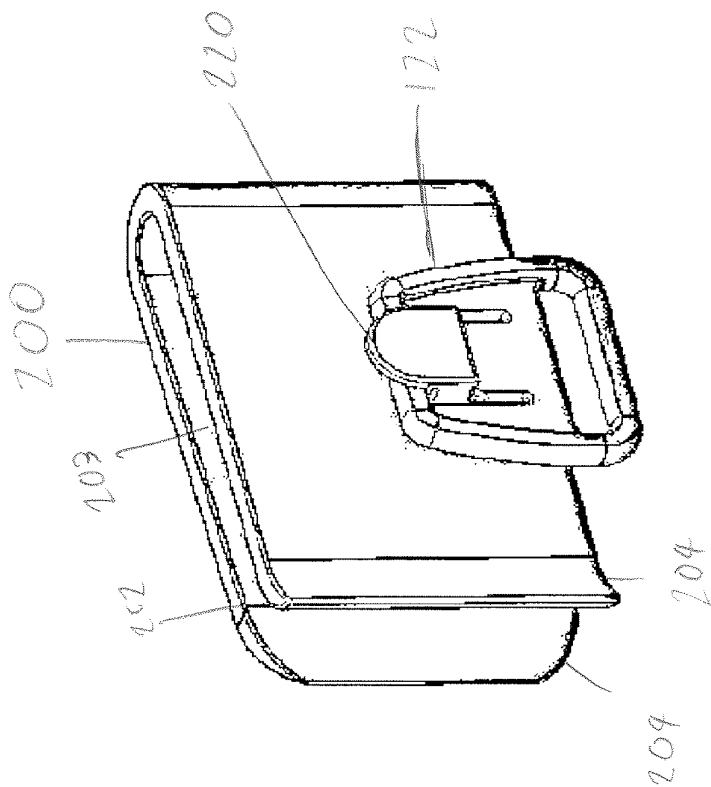


Fig. 2B





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Fig. 3A

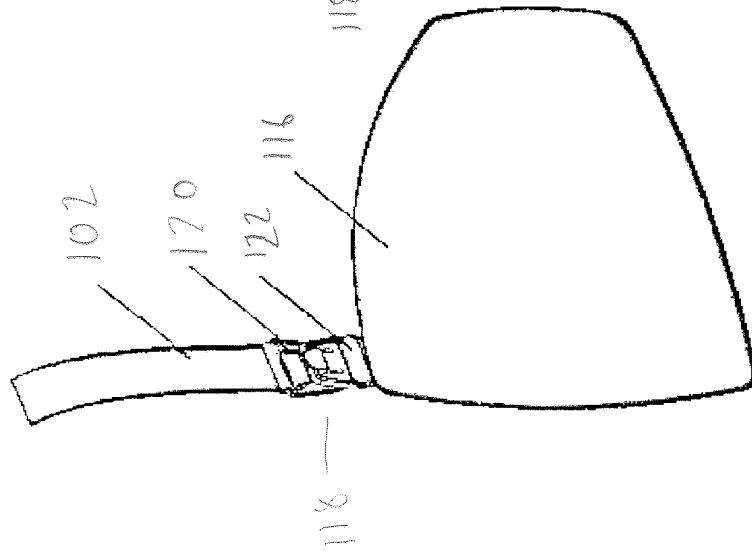


Fig. 3B

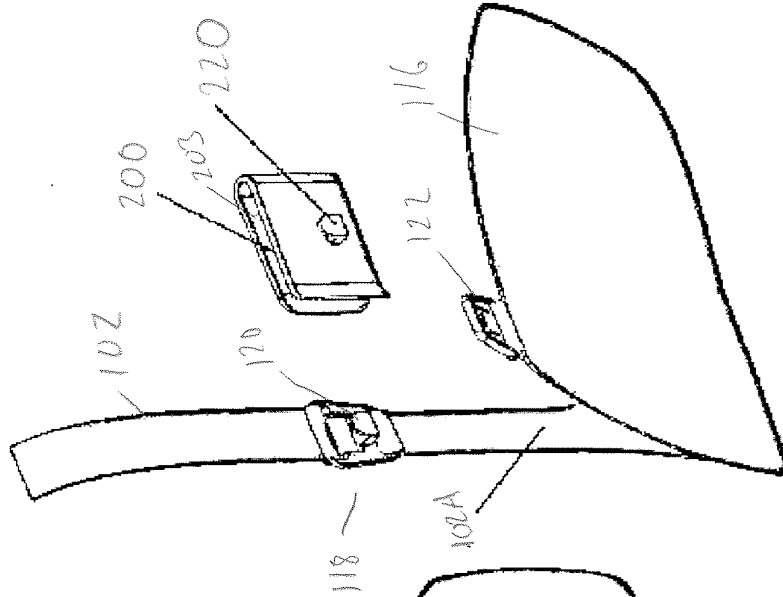
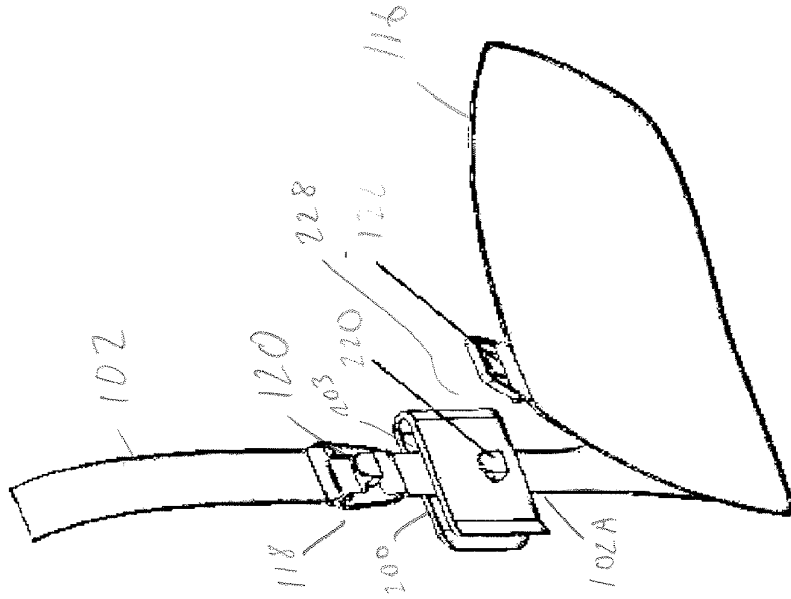


Fig. 3C



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Fig. 4A

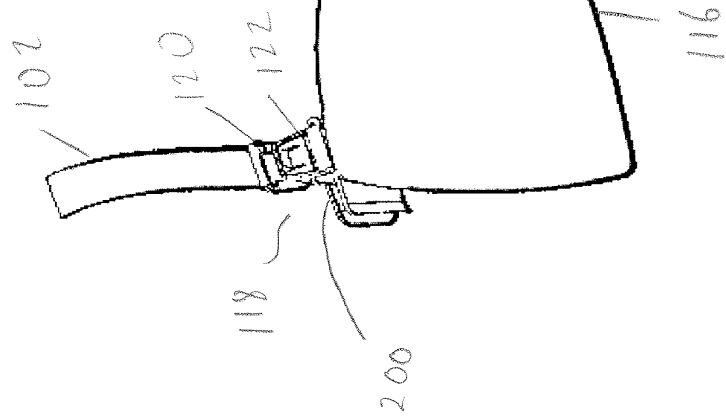
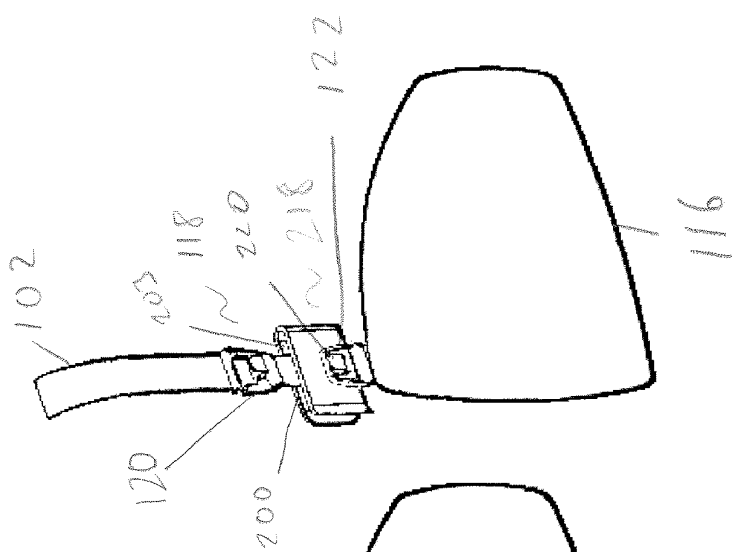
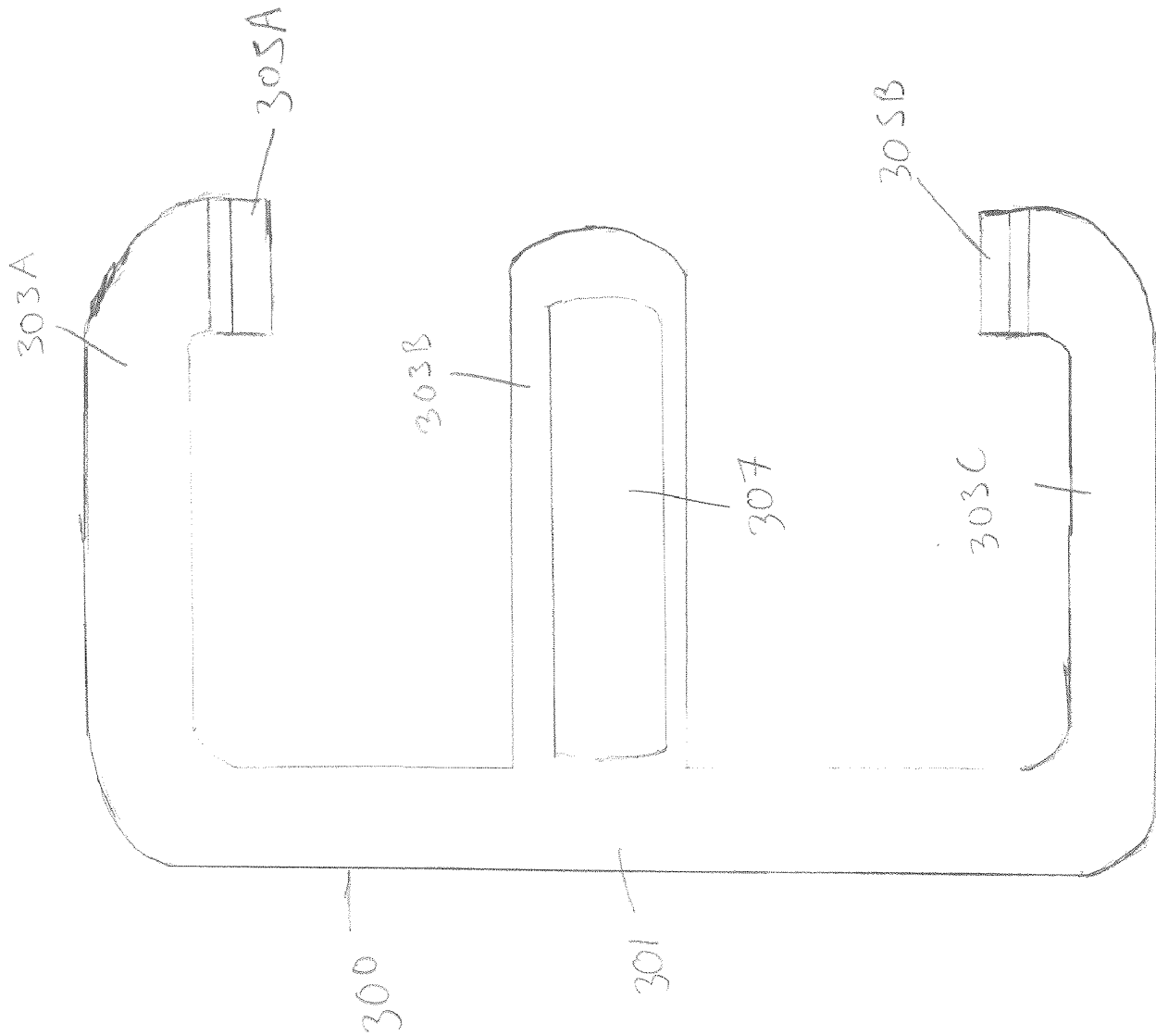


Fig. 4B



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Fig. 5



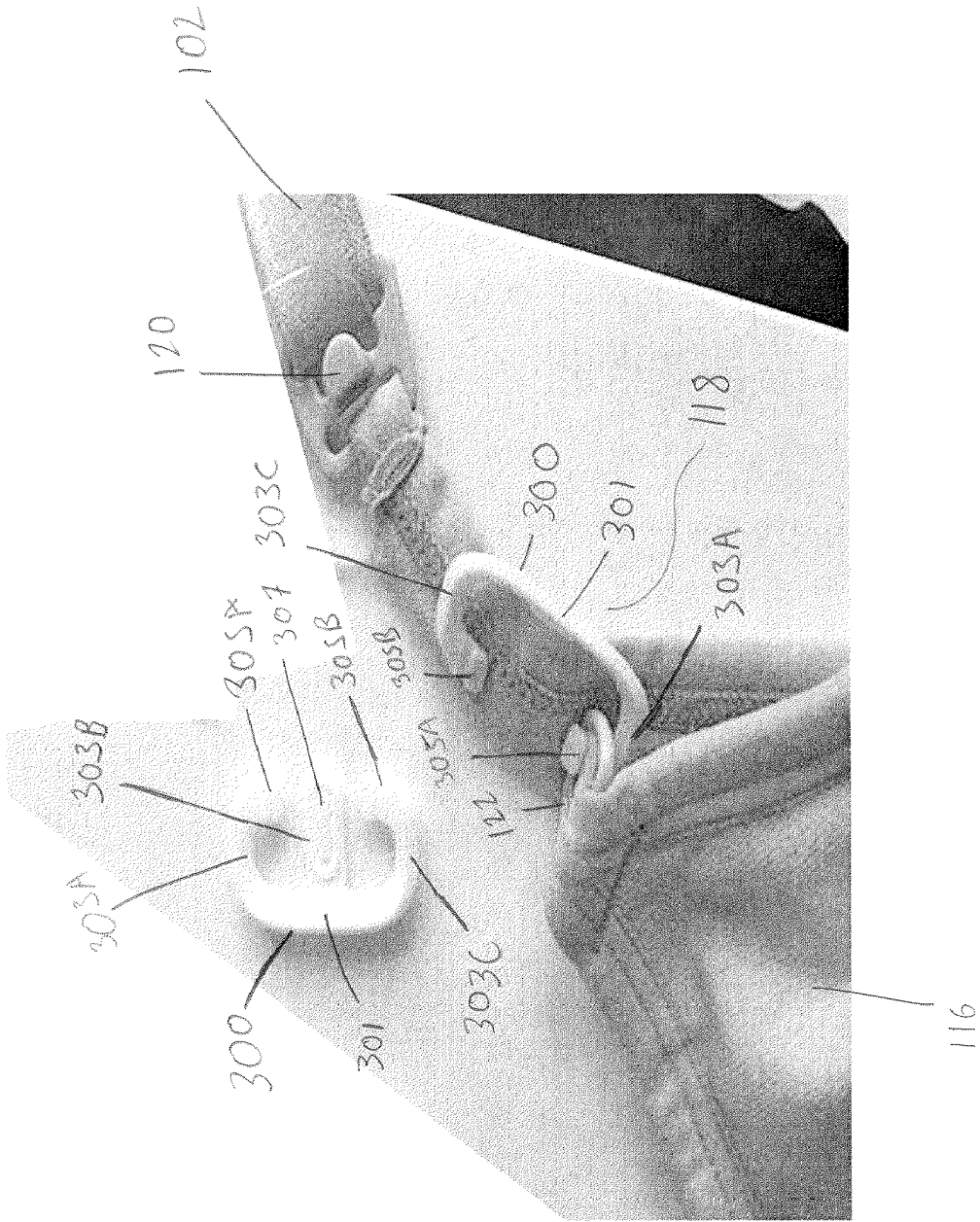
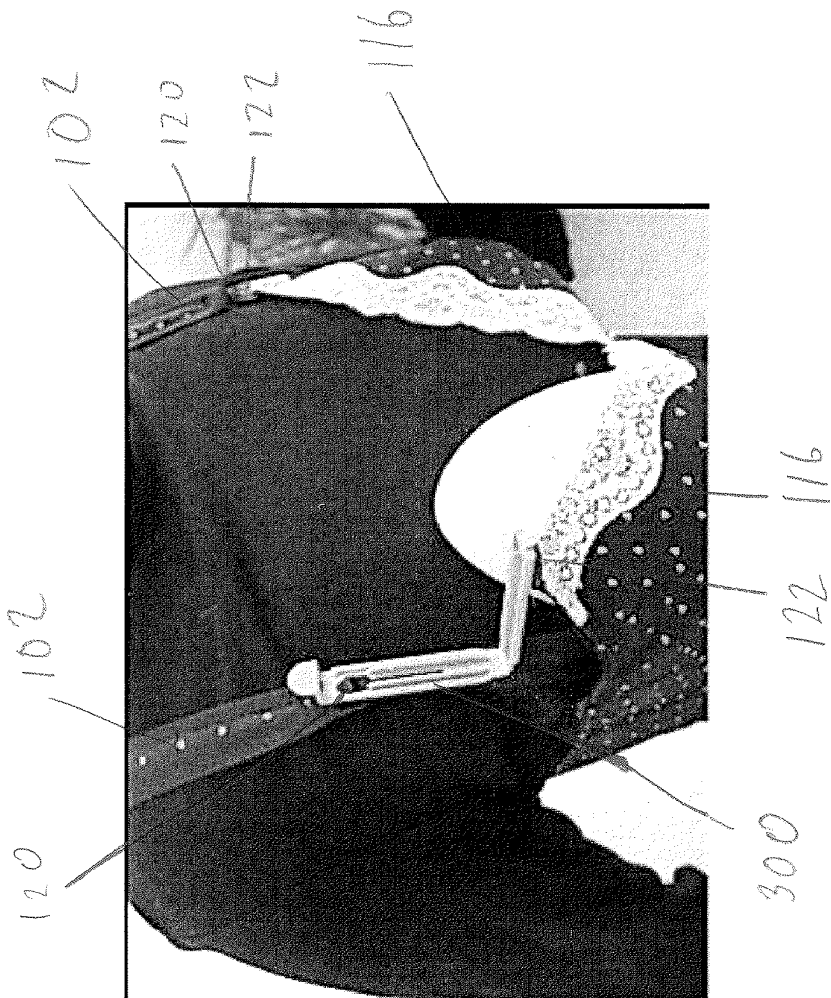


Fig. 6

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Fig. 7





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**Application number** GB 1709564.7

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2. Full name, address and postcode of the applicant or of each applicant	<b>CHIARO TECHNOLOGY LIMITED</b> <b>Second Floor 63-66 Hatton Garden</b> <b>London EC1N 8LE</b> <b>Greater London</b> <b>United Kingdom</b> <b>11287869002</b>		
Patents ADP number (if you know it)			
3. Title of the invention	<b>A LIQUID LEVEL MEASUREMENT SYSTEM</b>		
4. Name of your agent (if you have one)	<b>Boult Wade Tennant</b>		
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Patents ADP number (if you know it)			
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	Country	Application number	Date of filing
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		Number of earlier UK application	Date of filing (day / month / year)
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Are all the applicants named above also inventors?	<b>No</b>		
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Claim(s): **3**

Abstract: **n/a**

Drawing(s): **4**

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Country	Application number	Date of filing	PDAS Access Code
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10. If you are also filing any of the following, state how many against each item.

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Statement of inventorship and right to grant of a patent  
(Patents Form 7): **1**

Request for search (Patents Form 9A): **1**

Request for a substantive examination (Patents Form 10): **0**

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11. I/We request the grant of a patent on the basis of this application.

Signature: **/DRAPER, Martyn John/**

Date: **15 Jun 2017**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

**DRAPER, Mr Martyn**  
**Email: [boult@boult.com](mailto:boult@boult.com)**  
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## **A LIQUID LEVEL MEASUREMENT SYSTEM**

### **BACKGROUND**

5 The present invention relates to a sensing mechanism for detecting the level of liquid in a container. In a particular arrangement, the present invention relates to such a sensing mechanism when used along with a breast pump.

10 In the context of breast pumps, it is useful to measure the quantity of expressed milk. One way to do this is to have a clear container affixed to the breast pump, through which the level of expressed milk inside the container can be visibly determined. However, such visual determinations are not always possible, for example in a breast pump that collects milk while being worn inside a maternity bra.

15 An existing apparatus for detecting the level of liquid inside a container of a breast pump is that disclosed in US 2016/296681. In this apparatus, a sensing mechanism is provided at the top of a container, which measures droplets of liquid, specifically breast milk, entering the container. By measuring the properties of these droplets entering the container, the apparatus can determine the quantity of liquid which enters the container. In this apparatus, an accurate indication of the level of liquid in the container is reliant on the sensing  
20 mechanism being able to accurately record every droplet entering the container. Particularly at times when large flow rates of liquid enter the container, this accuracy cannot be guaranteed leading to significant cumulative errors. An accurate indication of the level of liquid in the container in this apparatus is also reliant on the sensing mechanism always being on during the pumping process, so that power consumption of the sensing  
25 mechanism is correspondingly high.

In view of the above, there is the need for an improved way to determine the level of liquid inside a container connected to a breast pump.

### **SUMMARY OF THE INVENTION**

30 According to a first aspect of the present invention, there is provided a breast pump comprising:

a pump module for pumping milk from a breast, the pump module being contained within a housing comprising a coupling;

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a container attachable to the housing via the coupling to receive milk from the pump;

a sensing assembly within the housing and comprising at least one optical emitter operable to emit optical radiation towards the surface of the body of milk held in the container when the housing is connected to the container, and an optical receiver for receiving the reflected radiation from the surface of the milk; and

a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the level of the milk inside the container based on the reflected radiation received by the optical receiver.

10

By determining the level of milk inside the container based on reflected radiation from the surface of the milk in the container, there is no need to monitor the individual droplets of milk entering the container, such that the sensing assembly can avoid errors associated with measuring these droplets. Furthermore, by not needing to measure these droplets, the sensing assembly from the breast pump need not always be on during the pumping process.

15

Preferably, the at least one optical emitter comprises at least two optical emitters. In this way, the sensing assembly from the breast pump can determine the level of milk inside the container more accurately and irrespective of the orientation of the liquid level inside the container.

20

Preferably, each optical emitter is equidistant from the optical receiver. In this way, the controller can more easily calculate the level of the milk inside the container based on the reflected radiation originating from each optical emitter.

25

Each optical emitter may be operable to emit radiation at a different wavelength, or at a different time, than the other optical emitters. In this way, the controller can more easily process the signals from the optical receiver, and more easily distinguish between the radiation emitted by each of the optical emitters.

30

Preferably, the optical emitter may emit radiation in the visible range of wavelengths. Alternatively it may be UV or IR light. The emitted wavelength is preferably between 10nm and 1mm.

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The signals from the optical receiver preferably comprise information relating to the intensity of the radiation received by the optical receiver.

Preferably, the sensing assembly comprises at least one accelerometer electrically  
5 connected to the controller. In one embodiment, the controller may be configured to record an accelerometer parameter from the accelerometer, and determine whether the accelerometer parameter exceeds a predetermined threshold. The predetermined threshold may be indicative of an excessive acceleration, which might cause sloshing of milk inside any container connected to the breast pump.

10 In some cases, the coupling may be a screw thread.

Preferably, the breast pump is sized to be similar to that of a female breast. On this basis, the breast pump is preferably no longer than 20cm in any given linear direction; more  
15 preferably no longer than 18cm in any given linear direction; and even more preferably no longer than 15cm in any given linear direction.

The breast pump may contain any suitable power source, such as a battery. The power source is preferably located in the housing.

20 In some cases, the container may comprise a window through which optical radiation can pass, wherein when the container is connected to the housing, radiation is operable to pass between the optical emitters/receiver and the inside of the container via the window. In other cases, the container may be made entirely of a material through which the optical radiation can pass.

25 When the container is connected to the housing, each optical emitter and the optical receiver are preferably located adjacent to the container, to ensure reliable transmission of radiation between the device and the container.

30 In this case, the portion of the container adjacent to each optical emitter and the optical receiver preferably comprises a surface inside the container which comprises at least one channel and/or feature for directing milk away from each optical emitter and/or the optical receiver. In this way the formation of milk on this surface, which would cause erroneous signals from the optical receiver, can be inhibited.

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To further inhibit the formation of milk in the vicinity of each optical emitter/receiver, the portion of the container adjacent to each optical emitter and the optical receiver may comprise a surface inside the container which comprises an oleophobic and/or hydrophobic coating.

5

Preferably, the container has a volumetric capacity of no more than 200ml. These volumetric capacities are particularly relevant when the container is a baby bottle.

10 It will be appreciated that the sensing assembly from the above breast pump has applications in other fields. Thus according to a second aspect of the present invention, there is provided a sensor module operable to be connected with a container for holding liquid, and suitable for use in detecting the level of liquid inside the container, the sensor module comprising:

a housing having a coupling for attachment to the top of the container;

15

a sensing assembly within the housing and comprising at least two optical emitters operable to emit optical radiation towards the surface of the body of liquid held in the container when the housing is connected to the container, and an optical receiver for receiving the reflected radiation from the surface of the liquid; and

20 a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the level of the liquid inside the container based on the reflected radiation received by the optical receiver.

Existing prior art for such a sensor module is the apparatus disclosed in RU2441367. In this apparatus, the container is an industrially sized milk tank, which only includes a single  
25 laser mounted at the top of the tank. Whilst this apparatus is suited for large-sized containers, which do not move in use, the apparatus is less-suited for applications where the container moves in use, or where the liquid level inside the container is non-perpendicular to the laser beam shone into the container. In contrast, the sensor module described above can be used in a variety of different applications, is conveniently located  
30 within a housing, and which by virtue of it having at least two optical emitters, can determine the level of liquid even inside containers of irregular shapes, and which can determine the level of liquid inside a container irrespective of the orientation of the liquid level inside the container.

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Although not fully recited herein, it will be appreciated that the sensor module according to the second aspect of the invention may include any or all of the optional features described in relation to the breast pump from the first aspect of the present invention.

5 According to a third aspect of the present invention, there is provided a collar incorporating the sensor module according to the second aspect of the invention, wherein the collar comprises a first end having the coupling, and a second end having a second coupling for attaching the collar to a lid of the container.

10 In the above case, the second coupling may be a screw thread.

According to fourth aspect of the present invention, there is provided a lid attachable to a container, wherein the lid comprises the sensor module according to the second aspect of the invention.

15

#### DESCRIPTION OF THE FIGURES

Figure 1A shows a sectional view of a device being used to determine the level of liquid in a container; and

15 Figure 1B shows a sectional view of the device and the container from Figure 1A being used at a different orientation.

20

Figure 2 shows a sectional view of the device and the container from Figure 1A being used whilst undergoing acceleration.

25 Figure 3 shows a sectional view of the device from Figure 1A being used as part of a breast pump assembly.

Figure 4 shows a sectional view of a device connected between a container and its lid, and which is operable to determine the level of liquid inside the container.

30

#### DETAILED DESCRIPTION

With reference to Figures 1A and 1B, there is shown a device 10 for use in detecting the level of liquid inside a container 100.

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The device 10 is formed of a housing 12 in which is located a sensing assembly 14 comprising a series of optical emitters 16 which are angled relative to, and each located equidistant from, an optical receiver 18. In operation of the device as will be described, each optical emitter 16 is operable to emit radiation which is received by the optical receiver 18.

The optical emitters 16 and the optical receiver 18 from the sensing assembly 14 are located in a portion 20 of the device 10 which faces the container 100 when the device 10 is connected to the container 100. The portion 20 of the device 10 containing the optical emitters 16 and the optical receiver 18 comprises a window 22 of material which is transparent to optical radiation. In this way, each of the optical emitters 16 and the optical receiver 18 have a line of sight through the window 22 into the container 100 when the device 10 is connected thereto.

A controller 30 comprising a CPU 32 and a memory 34 is provided in the device 10 for controlling the operation of the sensing assembly 14. An accelerometer 36 is also provided in the housing 10, which is operatively connected to the controller 30.

Operation of the device 10 when connected to the container 100 will now be described.

In a principal mode of operation, to determine the level L of liquid inside the container 100, the controller 30 instructs the optical emitters 16 to each emit radiation towards the surface of the liquid inside the container 100 at a given intensity. The optical receiver 18 receives the reflected radiation from each optical emitter 16 via the surface of the liquid and each of these intensities is recorded by the controller.

For each operation of the sensing assembly 14, the controller 30 records the intensities of radiation emitted by each of the optical emitters 16 as intensities  $IE_1; IE_2...IE_n$  (where n is the total number of optical emitters), and records the intensities of radiation received by the optical receiver 18 from each of the optical emitters 16 as received intensities  $IR_1; IR_2...IR_n$ .

By comparing the emitted radiation intensities  $IE_1; IE_2...IE_n$  with the received radiation intensities  $IR_1; IR_2...IR_n$ , the controller 30 calculates a series of intensity ratios  $IE_1:IR_1; IE_2:IR_2...IE_n:IR_n$ , which are then used to determine the level of the liquid inside the container. At the most basic level, if the intensity ratio of  $IE_1:IR_1$  is the same as  $IE_2:IR_2$ ,

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given the optical emitters 16 are equidistant from the optical receiver 18, this indicates that the level of the liquid inside the container is parallel to the top of the bottle, as shown in Figure 1A. In contrast, if these two intensity ratios are different, this indicates that the liquid level is at a different angle, such as that shown in Figure 1B.

5

To accurately determine the level and the quantity of liquid inside the container 100, the controller 30 processes the recorded intensity ratios using a database located in the memory 34. The database contains an individual record for each container which is operable to connect with the device 10. Each record from the database contains a look-up  
10 table of information, which contains expected intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) for the container 100 when filled at different orientations, and with different quantities of liquid.

By comparing the information from the look-up table with the recorded intensity ratios, the controller 30 calculates the level and quantity of liquid inside the container 100 and stores  
15 this information in the memory 34.

In situations where a container 100 to the device 10 contains no stored record in the database, the sensing assembly 14 can be used in a calibration mode to create a new record. In the calibration mode, the sensing assembly 14 is operated as the container is  
20 filled, and as it is located at different orientations. At each point during the calibration mode, the controller 30 calculates the recorded intensity ratios ( $IE_1:IR_1$  and  $IE_2:IR_2$ ) and stores them in the record relating to the container 100. For each set of recorded intensity ratios, the user includes information in the record relating to the orientation and fill level of liquid inside of the container 100.

25

To improve the accuracy of the results obtained by the device 10 during its use, the controller 30 when recording each intensity ratio also records a parameter from the accelerometer 36 relating to the acceleration experienced by the device 10. For each recorded acceleration parameter, the controller 30 determines whether the parameter  
30 exceeds a predetermined threshold acceleration parameter stored in the memory 34. The predetermined threshold is indicative of an excessive acceleration, which causes sloshing of liquid inside the container 100 connected to the device 10. In the event of a recorded acceleration parameter exceeding the predetermined threshold acceleration parameter, the controller 30 flags the recorded intensity ratios associated with the recorded acceleration  
35 parameter as being unreliable (due to sloshing).



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Even without the use of the accelerometer 36, the controller 30 is nonetheless operable to determine whether a set of recorded intensity ratios occur during a period of excess acceleration. In this regard, for each set of intensity ratios recorded at a given time, the controller 30 checks whether any of these intensity ratios is of a predetermined order of magnitude different than the remaining recorded intensity ratios from the set. In the event that the controller 30 determines that this is the case, this indicates that the liquid inside the container has 'sloshed' as a result of the excess acceleration, as shown in Figure 2. In this event, the controller 30 flags the set of recorded intensity ratios as being unreliable.

It will be appreciated that instead of recording the relative intensities of radiation emitted by the optical emitters 16 with the radiation received by the optical emitter 18, the controller 30 could instead record the time taken for radiation emitted by each of the optical emitters 16 to be received by the optical receiver 18. In this arrangement, the look up table would instead contain time periods as opposed to intensity ratios.

In terms of the applications for the device 10, it will be appreciated that the device can be used in a wide variety of applications.

One possible application is the use of the device 10 to determine the level of liquid located within a container 100, such as a baby bottle, used as part of a breast pump assembly. In this arrangement, the device 10 is associated with a breast pump 200 which assists with the expression of milk from a breast. The breast pump may be located in the housing 12 of the device 10 as shown in Figure 3, or it may be realisably connected to the housing 12. Either way, the device 10 would be connectable to the container 100 such that milk expressed by the breast pump can pass from the pump via a channel 202 into the container 100.

Another application for the device 10 is as a collar for detecting the level/quantity of liquid in a container 100, such as a baby bottle, via its lid 102. An example of the device 10 being used as such a collar is shown in Figure 4. In this arrangement, the device 10 is located between the container 100 and the lid 102, and comprises a first end 42 having a first coupling 44 for attaching the collar to the lid 102. The device comprises a second end 46 having a second coupling 48 for attaching the device 10 to the container 100. In Figure 4,

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the first and second couplings are shown as screw threads which engage with respective screw heads on the lid 102 and the container 100.

To allow the device 10 to pass liquid from the lid 102 to the container 100, the device  
5 comprises a channel 50 passing from the first end 42 to the second end 46.

In a further application, the device 10 may be integrated into the lid 102 of a container 100. In this application, the device 10 has a similar configuration to that shown in Figure 4, except that the first end 42 is covered and has no coupling 44.

10

It will be appreciated the device may be connected to a wide variety of different containers 100. In some applications, the container 100 may be a baby bottle, or a drinks bottle.

15

In certain applications, the container 100 connected to the device 10 may have a volumetric capacity of no more than 500ml, less than 400ml, less than 300ml, and/or less than 200ml. These volumetric capacities are particularly relevant when the container is a baby bottle/drink bottle.

20

It will also be appreciated that the container 100 connected to the device 10 may comprise an inside surface which comprises an oleophobic and/or hydrophobic coating. In this way, the container 100 is easy to clean between uses. When such a coating is applied to the portion of the container 100 which is adjacent to the optical emitters 16 and the optical receiver 18 from the device 10, this coating also helps prevent liquid from forming in front of these emitters/receiver, which might cause erroneous signals to be recorded by the optical  
25 receiver 18 from the sensing assembly 14.

25

30

To further reduce such erroneous signals, the portion of the container adjacent to the optical emitters and the optical receiver may comprise a surface inside the container having at least one channel and/or feature for directing liquid away from the optical emitters and/or the optical receiver.

35

To improve the accuracy of the sensing assembly 14, the container 100 may be made opaque to prevent ambient radiation outside the container 100 from reaching the optical receiver 18. Other possibilities to improve the accuracy to the accuracy of the sensing assembly 14 include the provision of a distinctive pattern/colour/texture on the bottom

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inside surface of the container 100. In this way, the distinctive bottom inside surface can be used by the sensing assembly 14 to more easily calibrate itself to the container 100 on which the distinctive bottom inside surface is located. The distinctive bottom may also be used to help identify which container 100 the device is connected to, and thus which record  
5 should be used from the database when the device 10 is used.

To further improve the accuracy of the sensing assembly 14, the controller 30 may also be configured to use the recorded information from the accelerometer 36, in situations where the record acceleration is below the predetermined threshold acceleration parameter, to  
10 calculate a more accurate liquid level and/or quantity of liquid located inside the container which is compensated for acceleration.

In one particular arrangement, the controller 30 may poll the accelerometer 36 prior to each operation of the sensing assembly 14 to verify that the device 10 is not currently  
15 undergoing excessive acceleration. In the event of the controller 30 determining excessive acceleration in the device 10, the controller 30 would continually re-poll the accelerometer, and not operate the sensing assembly 14, until the parameter from the accelerometer is determined as being below the predetermined threshold acceleration parameter stored in the memory 34.

20 It will also be appreciated that for each container record stored in the database, the container record may comprise a plurality of look up tables, wherein each look up table is associated with a particular liquid used in the container, and wherein each look up table contains its own set of intensity ratios. In this way, the device 10 can more accurately  
25 determine the level/quantity of different liquids used in a particular container 100.

As described herein, the sensing assembly 14 has been described as having a plurality of optical emitters 16. It will be appreciated however that the sensing assembly could operate using a single optical emitter 16 and plurality of optical receivers 18. In this arrangement,  
30 each record from the database would contain a plurality of ratios relating to the emitted radiation from the optical emitter 16 as received by each of the optical receivers 18. In use of the device 10, the controller 30 would then similarly record the emitted radiation from the optical emitter 16 as received by each of the optical receivers 18. In an alternate  
35 arrangement, there may be provided a plurality of optical emitters 16 and a plurality of optical receivers 18, wherein each optical emitter 16 is associated with a respective optical

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receiver 18. In its simplest arrangement, the sensing assembly 14 may comprise a single optical emitter 16 and a single optical receiver 18.

5 In certain configurations, the optical emitters 16 may together emit radiation having the same wavelength. In other configurations, the optical emitters 16 may each emit radiation having a different wavelength. In this latter configuration, the optical receiver 18 would then be able to determine which optical emitter 16 is associated with any given received radiation, based on the wavelength of the received radiation.

10 The optical emitters 16 may also each emit radiation at different times, such to allow the controller 30 to more easily process the signals from the optical receiver 18, and more easily distinguish between the radiation emitted by each of the optical emitters 16.

15 In relation to the electrical connection between the controller 30 and the sensing assembly 14, it will be appreciated this electrical connection may be either a wired/wireless connection as required.

20 Although not shown in the Figures, the device 10 herein described is preferably powered by a battery or some other power source located in the device 10. In other embodiments, the device 10 may be powered using mains electricity.

25 In one configuration, it is also envisaged that rather than the controller 30 comparing the information from the look-up table with the recorded intensity ratios to calculate the level and quantity of liquid inside the container 100, the controller 30 could instead process the recorded intensity ratios through a liquid-level equation stored in the memory 34. In this configuration, the liquid-level equation could be a generalised equation covering a family of different containers, or could be an equation specific to a container having a given shape and/or type of liquid inside.

30 It will also be appreciated that in some applications of the device 10, the device could be used to detect the level of a solid, as opposed to a liquid, in a container.

35 As used herein, the terms 'optical emitter' and 'optical receiver' are intended to cover sensors which can emit radiation in or close to the optical wavelength. Any type of radiation at or close to the optical wavelength is suitable provided that it does not have any harmful

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effects. The exact wavelength is not important in the context of the invention. Such sensors thus include those which can emit visible radiation (such as radiation having wavelengths in the region of 400nm-700nm), and/or those which can emit IR radiation (such as radiation having wavelengths in the region of 700nm-1mm and/or those which can emit UV radiation  
5 (such as radiation having wavelengths in the region of 10nm to 400nm).

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CLAIMS:

1. A breast pump comprising:

5 a pump module for pumping milk from a breast, the pump module being contained within a housing comprising a coupling;

a container attachable to the housing via the coupling to receive milk from the pump;

10 a sensing assembly within the housing and comprising at least one optical emitter operable to emit optical radiation towards the surface of the body of milk held in the container when the housing is connected to the container, and an optical receiver for receiving the reflected radiation from the surface of the milk; and

a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the level of the milk inside the container based on the reflected radiation received by the optical receiver.

15

2. A breast pump according to claim 1, wherein the at least one optical emitter comprises at least two optical emitters.

3. A breast pump according to claim 2, wherein each optical emitter is equidistant from the optical receiver.

20

4. A breast pump according to claim 2 or 3, wherein each optical emitter is operable to emit radiation at a different wavelength, or at a different time, than the other optical emitters.

25

5. A breast pump according to any preceding claim, wherein each optical emitter is an IR optical emitter, and the optical receiver is an IR optical receiver.

6. A breast pump according to any preceding claim, wherein the signals from the optical receiver comprise information relating to the intensity of the radiation received by the optical receiver.

30

7. A breast pump according to any preceding claim, wherein the sensing assembly comprises at least one accelerometer electrically connected to the controller.

35

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8. A breast pump according to any preceding claim, wherein the coupling is a screw thread.

9. A breast pump according to any preceding claim, wherein the breast pump is no longer than 20cm in any given linear direction.

10. A breast pump according to any preceding claim, wherein the breast pump contains a power source.

11. A breast pump according to any preceding claim, wherein the container comprises a window through which optical radiation can pass, wherein when the container is connected to the housing, radiation is operable to pass between each optical emitter/receiver and the inside of the container via the window.

12. A breast pump according to any preceding claim, wherein when the container is connected to the housing, each optical emitter and the optical receiver are located adjacent to the container.

13. A breast pump according to claim 12, wherein the portion of the container adjacent to each optical emitter and the optical receiver comprises a surface inside the container which comprises at least one channel and/or feature for directing milk away from each optical emitter and/or the optical receiver.

14. A breast pump according to claim 12 or 13, wherein the portion of the container adjacent to each optical emitter and the optical receiver comprises a surface inside the container which comprises an oleophobic and/or hydrophobic coating.

15. A breast pump according to any preceding claim, wherein the container has a volumetric capacity of no more than 200ml.

16. A sensor module operable to be connected with a container for holding liquid, and suitable for use in detecting the level of liquid inside the container, the sensor module comprising:

a housing having a coupling for attachment to the top of the container;

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a sensing assembly within the housing and comprising at least two optical emitters operable to emit optical radiation towards the surface of the body of liquid held in the container when the housing is connected to the container, and an optical receiver for receiving the reflected radiation from the surface of the liquid; and

5 a controller electrically connected to the sensing assembly for receiving signals from the optical receiver and calculating the level of the liquid inside the container based on the reflected radiation received by the optical receiver.

10 17. A collar incorporating the sensor module according to claim 16, wherein the collar comprises a first end having the coupling, and a second end having a second coupling for attaching the collar to a lid of the container.

18. A collar according to claim 17, wherein the second coupling is a screw thread.

15 19. A lid attachable to a container, wherein the lid comprises the sensor module according to claim 16.



FIG 1A

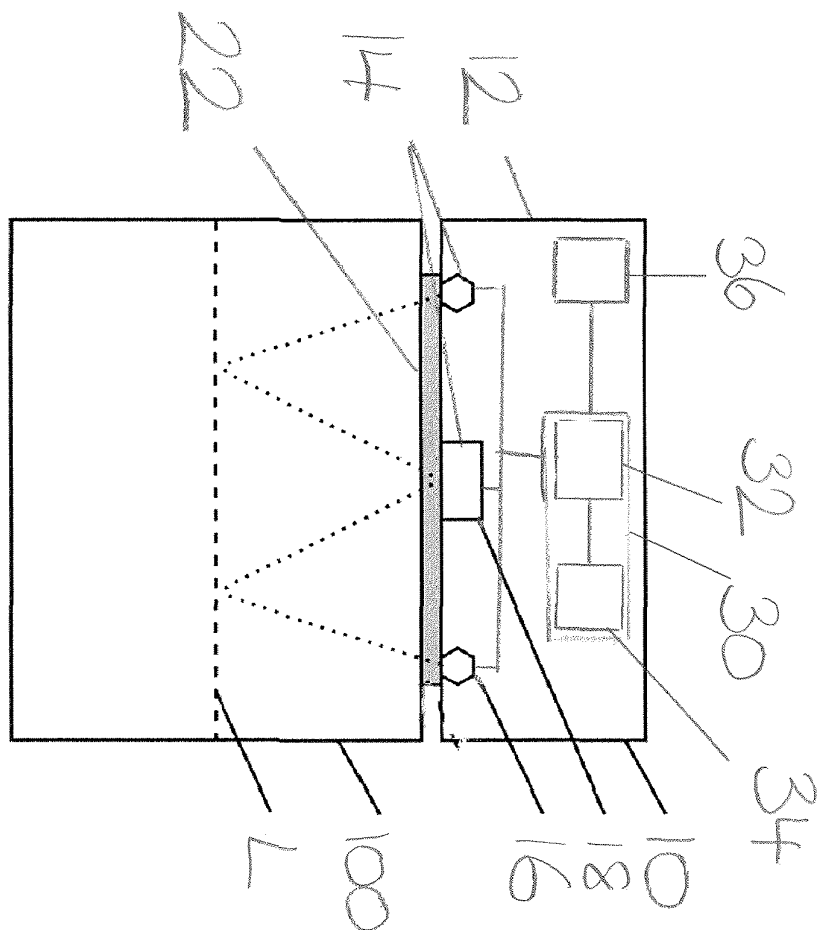
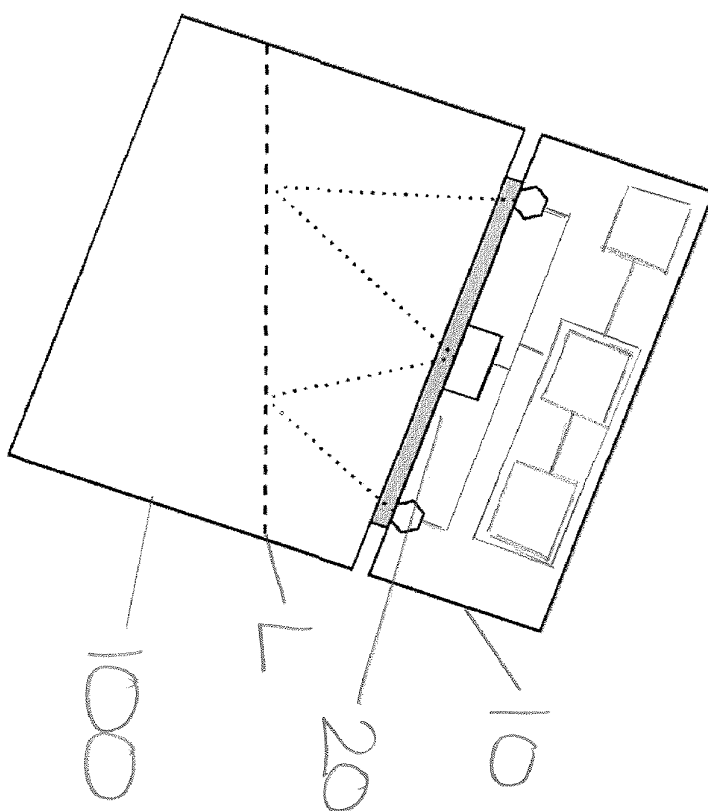


FIG 1B



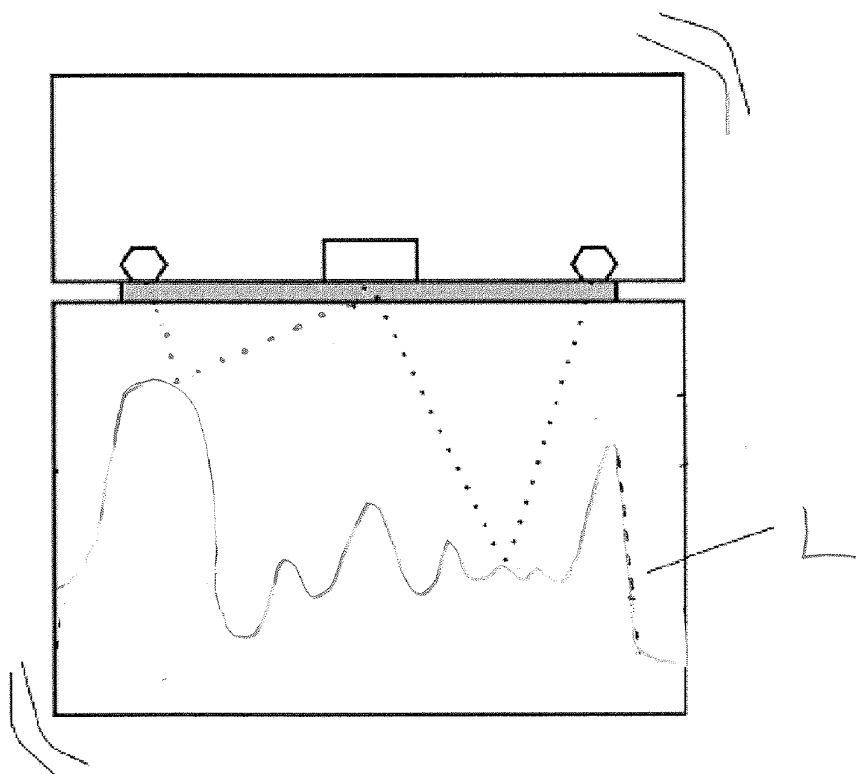
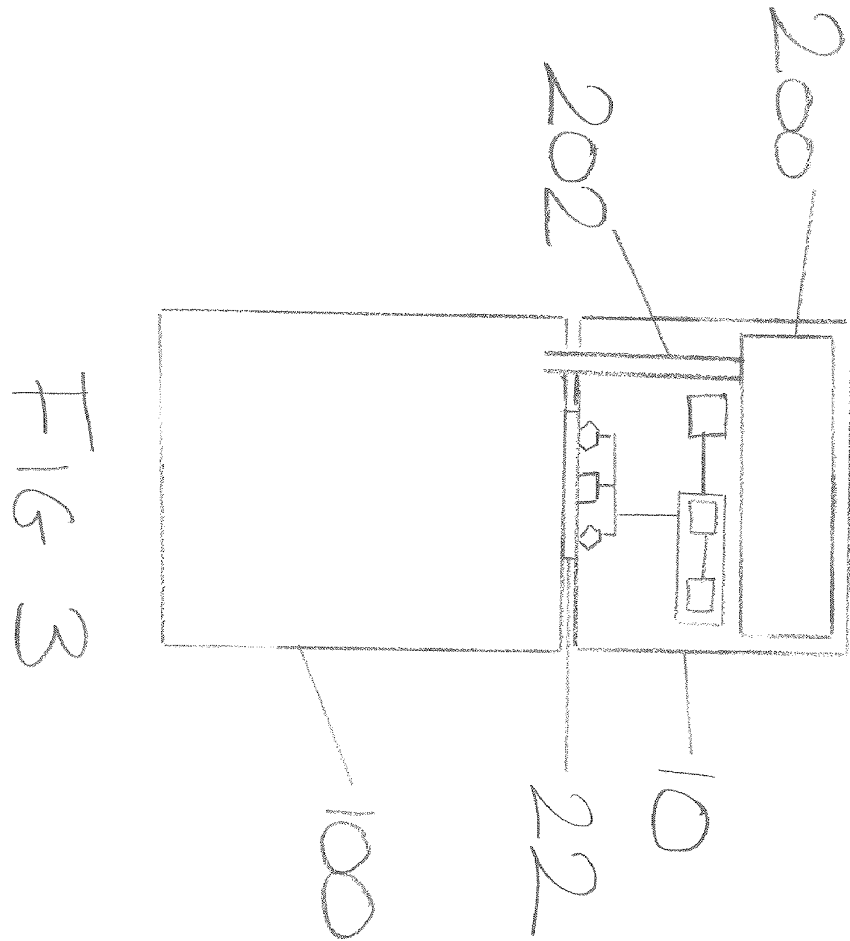


FIG 2



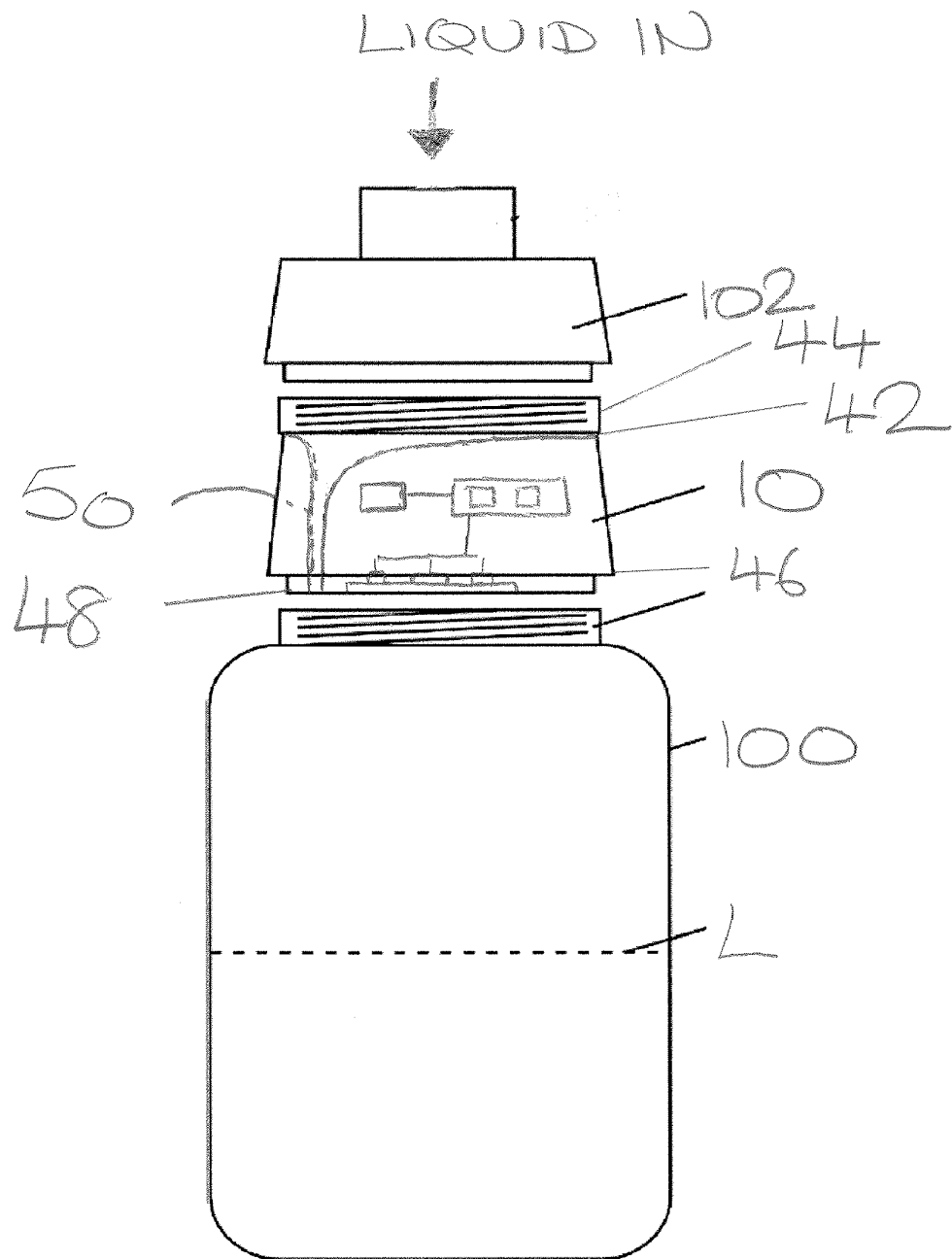


FIG 4.



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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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	2	7833190	B1	2010-11-16	HALL	

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	1	20070135761	A1	2007-06-14	CHENG, et al.	
	2	20070179439	A1	2007-08-02	VOGELIN, et al.	
	3	20090281485	A1	2009-11-12	BAKER, et al.	
	4	20110009824	A1	2011-01-13	YODFAT, et al.	

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5	20160271305	A1	2016-09-22	KURIHARA, et al.
6	20160296682	A1	2016-10-13	PHILLIPS, et al.
7	20160325031	A1	2016-11-10	MILLER, et al.
8	20170095599	A1	2017-04-06	KONDO, et al.
9	20170112983	A1	2017-04-27	THORNE, et al.
10	20180028733	A1	2018-02-01	RIGERT, et al.
11	20180333523	A1	2018-11-22	CHANG, et al.

If you wish to add additional U.S. Published Application citation information please click the Add button.

Add

## FOREIGN PATENT DOCUMENTS

Remove

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup> i	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							

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## NON-PATENT LITERATURE DOCUMENTS

Remove

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number	17181057
Filing Date	2021-02-22
First Named Inventor	Jonathan O'Toole
Art Unit	3783
Examiner Name	
Attorney Docket Number	373499.00049

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1		

If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.



# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

( Not for submission under 37 CFR 1.99)

Application Number	17181057
Filing Date	2021-02-22
First Named Inventor	Jonathan O'Toole
Art Unit	3783
Examiner Name	
Attorney Docket Number	373499.00049

## CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark D. Simpson/	Date (YYYY-MM-DD)	2021-09-05
Name/Print	Mark D. Simpson	Registration Number	32942

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	43688914
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	78905
<b>Filer:</b>	Mark D. Simpson/Lynn White
<b>Filer Authorized By:</b>	Mark D. Simpson
<b>Attorney Docket Number:</b>	373499.00049
<b>Receipt Date:</b>	05-SEP-2021
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	19:42:04
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	no
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	38945165_1.PDF	1035283  f7c2571aacda3d7b74c7754f87b8c232447b a959	no	5

**Warnings:**

**Information:****Total Files Size (in bytes):**

1035283

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PA..  
Document Description: Power of Attorney

PTO/AIA/82A (07-13)  
Approved for use through 03/31/2021. OMB 0651-0035  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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## If the TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	17/181,057		
Filing Date	February 22, 2021		
First Named Inventor	Jonathan O'TOOLE		
Title	BREAST PUMP SYSTEM		
Art Unit	3783		
Examiner Name	Courtney B. Fredrickson		
Attorney Docket Number	ELVI-002/06US		
<b>SIGNATURE of Applicant or Patent Practitioner</b>			
Signature	/Kassity L. Mai/	Date (Optional)	September 16, 2021
Name	Kassity L. Mai	Registration Number	68,774
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
<p><b>NOTE:</b> This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.</p>			
<div style="display: flex; align-items: center;"> <input style="width: 20px; height: 20px; margin-right: 5px;" type="checkbox"/> <span>*Total of <u>1</u> forms are submitted.</span> </div>			

Doc Code: PA..  
Document Description: Power of Attorney

PTO/AIA/82B (07-13)

Approved for use through 03/31/2021. OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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## POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

58249

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

**Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:**

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Chiaro Technology Limited

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

### SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	<i>Hannah Brunskill</i>	Date (Optional)	September 13, 2021
Name	Hannah Brunskill		
Title	Head of Legal		

**NOTE:** Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	43786749
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	78905
<b>Filer:</b>	Kassity L. Mai/Julie Chandler
<b>Filer Authorized By:</b>	Kassity L. Mai
<b>Attorney Docket Number:</b>	373499.00049
<b>Receipt Date:</b>	16-SEP-2021
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	16:52:23
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	no
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	ELVI_002_06US_Power_Of_attorney.pdf	119126 c86d0c5919fa87119748a8b379a058ebcaa a8ab2	no	2

**Warnings:**

**Information:****Total Files Size (in bytes):**

119126

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.





## UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
 Address: COMMISSIONER FOR PATENTS  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/181,057	02/22/2021	Jonathan O'TOOLE	373499.00049

CONFIRMATION NO. 4690

## POWER OF ATTORNEY NOTICE



OC000000128525873

78905  
 Saul Ewing Arnstein & Lehr LLP (Philadelphia)  
 Attn: Patent Docket Clerk  
 Centre Square West  
 1500 Market Street, 38th Floor  
 Philadelphia, PA 19102-2186

Date Mailed: 09/21/2021

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/16/2021.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ttran/



## UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
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 Alexandria, Virginia 22313-1450  
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/181,057	02/22/2021	Jonathan O'TOOLE	ELVI-002/06US

**CONFIRMATION NO. 4690****POA ACCEPTANCE LETTER**

OC000000128525909

58249  
 COOLEY LLP  
 ATTN: IP Docketing Department  
 1299 Pennsylvania Avenue, NW  
 Suite 700  
 Washington, DC 20004

Date Mailed: 09/21/2021

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 09/16/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/ttran/

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Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	Courtney B. FREDRICKSON
Attorney Docket Number	ELVI-002/06US 339454-2025

Sheet

1

of

2

**U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	1.	7,666,162 B2	02-23-2010	Renz et al.	
	2.	8,608,685 B2	12-17-2013	Tashiro	
	3.	10,881,766 B2	01-05-2021	O'Toole et al.	
	4.	10,926,011 B2	02-23-2021	O'Toole et al.	
	5.	2004/0087898 A1	05-06-2004	Weniger	
	6.	2009/0281482 A1	11-12-2009	Baker et al.	
	7.	2010/0292636 A1	11-18-2010	Renz et al.	
	8.	2012/0165729 A1	06-28-2012	Cudworth	
	9.	2014/0263611 A1	09-18-2014	Bauer	
	10.	2016/0228625 A1	08-11-2016	Holtz et al.	
	11.	2018/0110900 A1	04-26-2018	Barack	
	12.	2021/0196873 A1	07-01-2021	O'Toole et al.	
	13.	2021/0196876 A1	07-01-2021	O'Toole et al.	
	14.	2021/0196874 A1	07-01-2021	O'Toole et al.	
	15.	2021/0196875 A1	07-01-2021	O'Toole et al.	
	16.	2021/0205511 A1	07-08-2021	O'Toole et al.	
	17.	2021/0205512 A1	07-08-2021	O'Toole et al.	
	18.	2021/0205513 A1	07-08-2021	O'Toole et al.	
	19.	2021/0205514 A1	07-08-2021	O'Toole et al.	
	20.	2021/0205515 A1	07-08-2021	O'Toole et al.	
	21.	2021/0205516 A1	07-08-2021	O'Toole et al.	
	22.	2021/0205517 A1	07-08-2021	O'Toole et al.	
	23.	2021/0205518 A1	07-08-2021	O'Toole et al.	
	24.	2021/0228789 A1	07-29-2021	O'Toole et al.	
	25.	2021/0268158 A1	09-02-2021	O'Toole et al.	

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	Courtney B. FREDRICKSON
Attorney Docket Number	ELVI-002/06US 339454-2025

Sheet

2

of

2

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> "Number" <sup>4</sup> "Kind Code <sup>5</sup> (if known)				
	26.	CN 101549180 A	10-07-2009	Pigeon Corp.	Corresponds to US8608685	
	27.	EP 0503280 A2	02-08-1992	Pierburg GmbH		
	28.	GB 2435617 B	03-05-2008	Playtex Products Inc.		
	29.	WO 2005/079441 A2	09-01-2005	Childrens Hospital Medical Center		

**NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
	30.	GB Search Report, dated Nov. 15, 2017, issued in priority GB Application No. GB1709561.3.	
	31.	GB Search Report, dated Nov. 28, 2017, issued in priority GB Application No. GB1709566.2.	
	32.	GB Search Report, dated Nov. 29, 2017, issued in priority GB Application No. GB1709564.7.	
	33.	International Search Report issued in PCT/GB2018/051659 dated December 4, 2018, 9 pages.	

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference ElviePumpPCT	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/GB2018/051659	International filing date ( <i>day/month/year</i> ) 15 June 2018 (15-06-2018)	(Earliest) Priority Date ( <i>day/month/year</i> ) 15 June 2017 (15-06-2017)
Applicant  CHIARO TECHNOLOGY LIMITED		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 9 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed  
☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☒ **Certain claims were found unsearchable** (See Box No. II)

3. ☒ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant  
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant  
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

- ☒ as suggested by the applicant  
☐ as selected by this Authority, because the applicant failed to suggest a figure  
☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

International application No.  
PCT/GB2018/051659**INTERNATIONAL SEARCH REPORT****Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 31-72(completely); 73-158(partially)  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-6, 11-14, 108-119(completely); 158(partially)

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2018/051659

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M1/06

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61M F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2016 010524 A (MURATA MANUFACTURING CO) 21 January 2016 (2016-01-21)  abstract figures 1-5,8  -----	1-6, 11-14, 108-119, 158
X	US 2013/023821 A1 (KHALIL GAMAL [CH] ET AL) 24 January 2013 (2013-01-24) cited in the application  page 3, paragraph 51-53 page 4, paragraph 66 - paragraph 69 figures 3-5,9-11  -----  -/-	1-6, 11-14, 108-119, 158



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

25 September 2018

Date of mailing of the international search report

04/12/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
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Authorized officer

Kempeneers, Johanna

## INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2018/051659

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2017/095599 A1 (KONDO DAISUKE [JP] ET AL) 6 April 2017 (2017-04-06)  page 3, paragraph 55 - paragraph 57 page 7, paragraph 146 - page 8, paragraph 175 figures 1,15,16  -----	1,2,4-6, 108, 112-114, 158
A	US 2016/271305 A1 (KURIHARA KIYOSHI [JP] ET AL) 22 September 2016 (2016-09-22) page 3, paragraph 51 - paragraph 56 page 4, paragraph 61 page 6, paragraph 91 - paragraph 93 figures 1,2,6  -----	1,2,14, 118,158



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2018/051659

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2016010524 A	21-01-2016	NONE	
-----			
US 2013023821 A1	24-01-2013	AU 2012286462 A1	13-02-2014
		BR 112014001185 A2	21-02-2017
		CH 705295 A1	31-01-2013
		CN 103687634 A	26-03-2014
		EP 2734250 A1	28-05-2014
		IL 230280 A	28-06-2018
		JP 6062937 B2	18-01-2017
		JP 2014529312 A	06-11-2014
		KR 20140040232 A	02-04-2014
		MY 166874 A	24-07-2018
		PL 2734250 T3	31-03-2017
		RU 2014104019 A	27-08-2015
		TW 201304827 A	01-02-2013
		US 2013023821 A1	24-01-2013
		WO 2013010286 A1	24-01-2013
-----			
US 2017095599 A1	06-04-2017	JP 6213677 B2	18-10-2017
		JP WO2016002606 A1	27-04-2017
		US 2017095599 A1	06-04-2017
		WO 2016002606 A1	07-01-2016
-----			
US 2016271305 A1	22-09-2016	EP 3037116 A1	29-06-2016
		JP 6245280 B2	13-12-2017
		JP 2017205654 A	24-11-2017
		JP WO2015115516 A1	23-03-2017
		US 2016271305 A1	22-09-2016
		WO 2015115516 A1	06-08-2015
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6, 11-14, 108-119(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features of the piezo air-pump; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump.

1.1. claims: 2(completely); 158(partially)

A wearable breast pump system as in claim 1, configured as a self-contained wearable device with an internal rechargeable battery; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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2. claims: 7-10, 120-127(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features of the diaphragm.

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3. claims: 15, 27, 28, 30, 87-95(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features of the milk container; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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4. claims: 16, 29, 73-86(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features of the breast shield; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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5. claims: 17-19, 21, 23, 128-157(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features related to flow measurement and indication; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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6. claims: 22(completely); 158(partially)

A wearable breast pump system as in claim 1, in which the centre of gravity with an empty milk container attached to the housing is at or below (i) the half-way height line of the housing or (ii) the horizontal line passing through a nipple tunnel or filling point on a breast shield (so that

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

the device that is not top-heavy for a woman using the pump); A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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7. claims: 24(completely); 158(partially)

A wearable breast pump system as in claim 1, including a data sub-system that collects and provides data to a connected device or remote application or remote sensor; A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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8. claims: 20, 25, 26, 96-107(completely); 158(partially)

A wearable breast pump system as in claim 1, including special technical features of the pump (control); A method of expressing and collecting milk, comprising the step of using such a wearable breast pump

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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

Continuation of Box II.2

Claims Nos.: 31-72(completely); 73-158(partially)

The present application contains 158 claims, of which 44 are independent.

There is no clear distinction between several of the 44 independent claims because of overlapping scope. Various independent claims directed to subject-matter that does not (completely) overlap do not meet the requirements of unity of invention (Rule 13 PCT).

According to what can be understood from the description, it seems that a protection is sought after for several aspects of a breast pump system:

- wearability (including a housing shaped at least in part to fit inside a bra)
- technical features of the breast shield
- technical features of the milk container
- technical features of the pump and its control to improve user comfort
- the pump is specifically a piezo air-pump (possibly two piezo air-pumps in series or in parallel), and details thereof

- a separate deformable diaphragm to generate negative air pressure inside the breast shield, the diaphragm as such separating the (piezo) air-pump from the breast shield such that the (piezo) air-pump forms part of a closed loop system
- a flow measurement and milk volume indication means

The 44 independent claims are either directed to one of the above aspects, or to what appears to be an aleatory mix and match of two or several of these aspects.

Moreover, from the 114 dependent claims, 85 claims are dependent on any of the 41 independent claims directed to a "system" (as well as on any of the other dependent claims). They too are directed to one of the above aspects, or to what appears to be an aleatory mix and match of two or several of these aspects.

There are thus so many claims, and they are drafted in such a way that the claims as a whole are not in compliance with the provisions of clarity and conciseness of Article 6 PCT, as it is particularly burdensome for a skilled person to establish the subject-matter for which protection is sought.

The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search (PCT Guidelines 9.19 and 9.25).

The search was based on the subject-matter that is expected to be claimed later in the procedure, and the corresponding independent claim 1. Moreover, independent claim 158, directed to a method of expressing and collecting milk, comprising the step of using a system as defined in claim 1, has also been searched. Independent claims 31-72 and independent claim 158 when referring to any of the independent

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

claims 31-72 were not searched. Claims 73-157 when being dependent on any of claims 31-72 were also not searched.

Since the claims dependent on claim 1 are not complying with unity of invention (Rule 13 PCT) (see non unity reasoning), the extent of the search was further limited to the technical features as claimed in claim 1 in combination with the first and second invention for which protection is sought, namely dependent claim 2 and the dependent claims further specifying details concerning the piezo air-pump (claims 3-6, 11-14, 108-119).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	44551001
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	58249
<b>Filer:</b>	Kassity L. Mai/Donna Doyle
<b>Filer Authorized By:</b>	Kassity L. Mai
<b>Attorney Docket Number:</b>	ELVI-002/06US
<b>Receipt Date:</b>	17-DEC-2021
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	18:41:20
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ELVI_002_06US_Preliminary_A mendment.pdf	140479	yes	7
			949ea1289cd835f3ad42a4577092106ea29 b755b		

Case 2:23-cv-00631-KKE Document 136-9 Filed 12/11/24 Page 497 of 1121

Multipart Description/PDF files in .zip description					
Document Description			Start	End	
Preliminary Amendment			1	1	
Claims			2	6	
Applicant Arguments/Remarks Made in an Amendment			7	7	
Warnings:					
Information:					
2	Transmittal Letter	ELVI-002-06US_IDS_Transmittal.pdf	121422	no	5
			8ccdd4991c96e1104e84665ec4c9e788ff70bf52		
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	ELVI-002_06US_SB08.pdf	198710	no	2
			93ee84ef4b3b6e1dd6a95df4f599b3d720561dba		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	CN101549180A_EFS.pdf	1275076	no	29
			f54627a3a1fd62e612dbea1ab0f2629f45e1ee73		
Warnings:					
Information:					
5	Foreign Reference	GB2435617B_EFS.pdf	1960765	no	67
			a0a3627bb157bf6bb2c164b58166364714e910b0		
Warnings:					
Information:					
6	Other Reference-Patent/App/Search documents	002-04WO_ISR.pdf	309414	no	9
			d00a7d0b55be23742a16f08f55945a2aa00c3979		
Warnings:					
Information:					

7	Foreign Reference	WO2005079441A2.pdf	3510260  39d881c285fcb2a70a4f5ef12d44bf42845c7d56	no	69
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>				7516126	
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					



Docket No.: ELVI-002/06US 339454-2025  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

First Inventor:	Jonathan O'TOOLE	Confirmation No.:	4690
Application No.:	17/181,057	Group Art Unit:	3783
Filed:	February 22, 2021	Examiner:	C. B. Fredrickson
For:	BREAST PUMP SYSTEM		

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**PRELIMINARY AMENDMENT**

Prior to examination of the above-identified application, please amend the above-captioned application as follows:

**Amendments to the Claims** are reflected on the listing of the claims which begins on page 2 of this paper.

**Remarks** begin on page 7 of this paper.

Application No.: 17/181,057

Docket No.: ELVI-002/06US 339454-2025

**IN THE CLAIMS:**

*Set forth below in ascending order, with status identifiers, is a complete listing of all claims currently under examination. Changes to any amended claims are indicated by [[double brackets]], ~~striketrough~~ and/or underlining. This listing also reflects any cancellation and/or addition of claims.*

1. (Currently Amended) A breast pump device that is configured as a self-contained, in-bra wearable device, comprising ~~and includes~~:

(i) a housing that includes (a) a ~~rechargeable~~ battery, and (b) ~~control electronics~~; (c) a pump generating negative air pressure;

(ii) a breast shield of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing, the breast shield made up of a breast flange and a nipple tunnel ~~and that is configured to be slid in and out of the housing~~, in which the breast shield is transparent or optically clear ~~and comes in several different sizes, each of which are configured to slide in and out of the same housing~~; and

(iii) a milk container that is configured to be attached to and removed from the housing ~~device~~.

2. (Currently Amended) The kit of Claim 3 ~~breast pump device of Claim 1~~, in which the plurality of interchangeable breast shields ~~different sizes of the breast shield~~ each provide a different spacing of ~~[[the]]~~ a nipple from side walls of the nipple tunnel~~[[,]]~~ when ~~[[the]]~~ that breast shield has been placed onto a breast.

3. (Original) The breast pump device of Claim 1, in which the breast shield is rigid.

4. (Currently Amended) The breast pump device of Claim 1, in which the breast shield is a ~~an~~ ~~optically clear~~, dishwasher safe, plastic ~~polycarbonate~~ breast shield.

**Application No.:** 17/181,057

**Docket No.:** ELVI-002/06US 339454-2025

5. (Currently Amended) The breast pump device of Claim 1, in which the breast shield is configured to attach ~~attaches~~ using magnets to the housing.

6. (Currently Amended) The breast pump device of Claim 1, in which the breast shield is configured to rotate smoothly around ~~[[the]]~~a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto ~~[[the]]~~a breast.

7. (Currently Amended) The breast pump device of Claim 1, in which the breast shield presents, in use, a single continuous surface to ~~[[the]]~~a nipple and a breast.

8. (Currently Amended) The breast pump device of Claim 1, in which the breast shield integrates the breast flange and the nipple tunnel as a single item.

9. (Currently Amended) The breast pump device of Claim 1, in which the breast shield is generally symmetrical about a centre-line running from ~~[[the]]~~a top to ~~[[the]]~~a bottom of the breast shield when positioned upright for normal use.

10. (Original) The breast pump device of Claim 1, in which the breast shield is configured to slide into the housing with a single push action.

11. (Original) The breast pump device of Claim 1, in which the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump.

12. (Original) The breast pump device of Claim 1, in which the milk container is rigid.

13. (Currently Amended) The breast pump device of Claim 1, in which the milk container is an optically clear, dishwasher safe, plastic ~~polycarbonate~~ milk container.

14. (Currently Amended) The breast pump device of Claim 1, in which milk container attaches to a lower part of the housing and forms ~~[[the]]~~a base of the breast pump device.

**Application No.:** 17/181,057

**Docket No.:** ELVI-002/06US 339454-2025

15. (Currently Amended) The breast pump device of Claim 1, in which the milk container is configured to magnetically attach ~~attaches~~ to the housing.

16. (Currently Amended) The breast pump device of Claim 1, in which the nipple tunnel includes guide lines running parallel ~~to the~~ along one or more sides of the nipple tunnel.

17. (Original) The breast pump device of Claim 1, in which the nipple tunnel includes an air hole or passage, and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage.

18. (Currently Amended) The breast pump device of Claim 1, in which the nipple tunnel includes on ~~[[its]]~~ a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container.

19. (Currently Amended) The breast pump device of Claim 1, in which the pump ~~the housing~~ includes one or more piezo air pumps.

20. (Currently Amended) The breast pump device of Claim 1, in which the housing further includes a Universal Serial Bus (USB) charging socket.

21. (Currently Amended) The breast pump device of Claim 1, in which the housing includes a left or right breast selector or toggle switch ~~on the housing~~, that, when selected for a particular pumping session ~~sessions~~, sends data to a connected ~~[[app]]~~ application configured to track ~~that tracks~~ pumping sessions, to indicate whether that particular session is associated with ~~[[the]]~~ a left or ~~[[the]]~~ a right breast.

22. (Currently Amended) The breast pump device of Claim 1, in which the housing is shaped to fit inside a bra by having an outer surface that is curved to fit ~~[[the]]~~ contours of a bra.

23. (Canceled) .

**Application No.:** 17/181,057

**Docket No.:** ELVI-002/06US 339454-2025

24. (Currently Amended) The breast pump device of Claim 1, in which the breast pump device is configured to deliver a maximum suction of approximately 240\_mmHg.

25. (Currently Amended) The breast pump device of Claim 1, in which the breast pump device includes a sensor that is configured to directly ~~measures the~~ measure a level of [[the]] milk in the milk container by measuring [[the]]an intensity of light reflected from [[the]]a surface of the milk stored in the milk container.

26. (Canceled)

27. (Canceled)

28. (Currently Amended) The breast pump device of Claim 1, in which the pump delivers in excess of 400\_mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.

29. (Currently Amended) The breast pump device of Claim 1, in which the pump is a lightweight air pump that enables [[the]]a total mass of the breast pump device, unfilled with milk, to be less than 250\_gm

30. (Currently Amended) The breast pump device of Claim 1, in which the breast pump device makes less than 30\_dB noise at maximum power and less than 25\_dB at normal power, against a 20\_dB ambient noise.

31. (New) A kit, comprising:

the breast pump device of Claim 1; and

the plurality of interchangeable breast shields.

32. (New) The kit of Claim 31, wherein each of the plurality of interchangeable breast shields includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to

**Application No.:** 17/181,057

**Docket No.:** ELVI-002/06US 339454-2025

visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.

33. (New) The breast pump device of Claim 1, wherein the battery is a rechargeable battery, and the housing further includes (c) a power charging circuit for controlling the charging of the rechargeable battery, and (d) control electronics powered by the rechargeable battery.

**Application No.:** 17/181,057

**Docket No.:** ELVI-002/06US 339454-2025

**REMARKS**

Entry and consideration of the foregoing amendments is respectfully requested. The above-noted amendments are supported by the application as originally filed and do not introduce any new matter.

The Director is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 50-1283.

Dated: December 17, 2021

Respectfully submitted,  
**COOLEY LLP**

**USPTO CUSTOMER NO. 58249**

COOLEY LLP  
ATTN: IP Docketing Department  
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Docket No.: ELVI-002/06US 339454-2025  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

First Inventor:	Jonathan O'TOOLE	Confirmation No.:	4690
Application No.:	17/181,057	Group Art Unit:	3783
Filed:	February 22, 2021	Examiner:	Courtney B. FREDRICKSON
For:	BREAST PUMP SYSTEM		

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 C.F.R. §§ 1.56, 1.97, AND 1.98**

In accordance with the duty of disclosure set forth in 37 C.F.R. §1.56, Applicant hereby submits the following information in conformance with 37 C.F.R. §§1.97 and 1.98. It is respectfully requested that the information be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

- [x] Pursuant to 37 C.F.R. §1.98, a copy of each non-US patent document except for cite nos. 26, 28, 29 and 33 cited on the attached Form used in lieu of PTO/SB/08 is enclosed.
- [x] No copies of the foreign patent, foreign patent application, or non-patent literature publications listed on the attached Form used in lieu of PTO/SB/08 are being provided pursuant to 37 C.F.R. §1.98(d) except for cite nos. 26, 28, 29 and 33 because the publications were previously cited by or submitted to the Office in prior Application Serial No(s). 16/009,547 to which the above-identified application claims priority under 35 U.S.C. §120.
- [x] No copies of any U.S. patents or U.S. patent application publications listed on the attached Form used in lieu of PTO/SB/08 are being provided pursuant to 37 C.F.R. §1.98.



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- ☐ Publication(s) listed on the attached Form used in lieu of PTO/SB/08 were cited in a foreign search or examination report corresponding to application serial no. and mailed on .
- ☐ Enclosed is a copy of a non-English publication(s) \_\_\_\_\_. Pursuant to §609 of the M.P.E.P., Applicant submits the attached foreign search or examination report, which cites such non-English language publication(s).
- ☐ Enclosed is a copy of a non-English publication(s) \_\_\_\_\_ English language publication \_\_\_\_\_ (copy enclosed) claims priority from this non-English publication.
- ☐ Enclosed is an explanation of non-English publication(s) \_\_\_\_\_ for which an English translation is not available.
- ☐ Enclosed is an English translation of non-English publication(s) \_\_\_\_\_ cited on the attached Form used in lieu of PTO/SB/08.
- ☐ Enclosed is an English language Abstract of non-English publication(s) \_\_\_\_\_ cited on the attached Form used in lieu of PTO/SB/08.
- ☐ Enclosed is a copy of pending patent Application No. \_\_\_\_\_.

☒ In accordance with **37 C.F.R. §1.97(b)**, no additional fee for submission of this Information Disclosure Statement is required, as it is filed within any one of the following time periods:

- ☐ within three months from the filing date of this national application other than a CPA under 37 C.F.R. § 1.53(d);
- ☐ within three months from the date of entry of the national stage as set forth in 37 C.F.R. §1.491 in this international application;
- ☒ before the mailing date of a first Office action on the merits; or
- ☐ before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114.

☐ In accordance with **37 C.F.R. §1.97(c)**, this Information Disclosure Statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing of any of the following: a final action under 37 C.F.R. §1.113; a notice of allowance under 37 C.F.R. §1.311; or an action that otherwise closes prosecution in this application.

In accordance with 37 C.F.R. §1.97(c) also enclosed is:

- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$260.00;
- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$130.00;
- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$65.00; or

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- ☐ Statement as specified in 37 C.F.R. §1.97(e):
  - ☐ Each item of information contained in the Information Disclosure Statement cited herein was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing date of the Information Disclosure Statement; or
  - ☐ No item of information contained in the Information Disclosure Statement submitted herewith was cited in any communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned, having made a reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing date of the Information Disclosure Statement.

☐ This Information Disclosure Statement is filed after payment of the issue fee, but before issuance of the patent under the Quick Path Information Disclosure Statement pilot program.

In accordance with the Quick Path Information Disclosure Statement pilot program also enclosed is:

- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$260.00;
- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$130.00;
- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$65.00;

and

- ☐ Statement as specified in 37 C.F.R. §1.97(e):
  - ☐ Each item of information contained in the Information Disclosure Statement cited herein was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing date of the Information Disclosure Statement; or
  - ☐ No item of information contained in the Information Disclosure Statement submitted herewith was cited in any communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned, having made a reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing date of the Information Disclosure Statement.

☐ In accordance with **37 C.F.R. §1.97(d)**, this Information Disclosure Statement is filed after the period specified in 37 C.F.R. § 1.97(c), but with or before the payment of the issue fee.

In accordance with 37 C.F.R. §1.97(d) also enclosed is:

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**Docket No.:** ELVI-002/06US 339454-2025

- ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$260.00;
  - ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$130.00; or
  - ☐ Fee under 37 C.F.R. §1.17(p) in the amount of \$65.00;
- and
- ☐ Statement as specified in 37 C.F.R. §1.97(e):
    - ☐ Each item of information contained in the Information Disclosure Statement cited herein was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing date of the Information Disclosure Statement; or
    - ☐ No item of information contained in the Information Disclosure Statement submitted herewith was cited in any communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned, having made a reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing date of the Information Disclosure Statement.

☐ In accordance with **37 C.F.R. § 1.704(d)**, Applicant notes that to our knowledge each item of information contained in the information disclosure statement:

- ☐ was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § **1.56(c)** more than thirty days prior to the filing of the information disclosure statement.
- ☐ is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § **1.56(c)** more than thirty days prior to the filing of the information disclosure statement.

In accordance with 37 C.F.R. § 1.97(g), this Information Disclosure Statement shall not be construed as to mean that a search has been made.

In accordance with 37 C.F.R. § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that the information cited in the statement is, or is considered to be material to patentability as defined by 37 C.F.R § 1.56(b).

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**Remarks**

It is respectfully requested that the Examiner consider the above-noted information and return an initialed copy of the attached Form used in lieu of PTO/SB/08 to the undersigned.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Applicant believes no fee is due with this response.

Dated: December 17, 2021

Respectfully submitted,  
**COOLEY LLP**

**USPTO CUSTOMER NO. 58249**

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875				Application or Docket Number 17/181,057		Filing Date 02/22/2021		<input type="checkbox"/> To be Mailed			
ENTITY: <input type="checkbox"/> LARGE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> MICRO											
<b>APPLICATION AS FILED - PART I</b>											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)			
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A					
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A					
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A					
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$50 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$240 =					
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL					
<b>APPLICATION AS AMENDED - PART II</b>											
		(Column 1)		(Column 2)		(Column 3)					
<b>AMENDMENT</b>	12/17/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 29	Minus	** 30	= 0			x \$50 =		0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0			x \$240 =		0	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
								TOTAL ADD'L FEE		0	
		(Column 1)		(Column 2)		(Column 3)					
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=			x \$0 =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=			x \$0 =			
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
								TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.											
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".										/LISA R EPPS/	
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".											
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.											

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	ELVI-002/06US	4690
58249	7590	01/26/2022	EXAMINER	
COOLEY LLP			FREDRICKSON, COURTNEY B	
ATTN: IP Docketing Department			ART UNIT	
1299 Pennsylvania Avenue, NW			PAPER NUMBER	
Suite 700			3783	
Washington, DC 20004			NOTIFICATION DATE	
			DELIVERY MODE	
			01/26/2022	
			ELECTRONIC	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

zIPPatentDocketingMailboxUS@cooley.com

**Office Action Summary****Application No.**

17/181,057

**Applicant(s)**

O'TOOLE et al.

**Examiner**

COURTNEY FREDRICKSON

**Art Unit**

3783

**AIA (FITF) Status**

Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 17December2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.

2a) ☐ This action is **FINAL**.

2b) ☒ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims\***

5) ☒ Claim(s) 1-22,24-25 and 28-33 is/are pending in the application.

5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

6) ☐ Claim(s) \_\_\_\_ is/are allowed.

7) ☒ Claim(s) 1-22,24-25 and 28-33 is/are rejected.

8) ☐ Claim(s) \_\_\_\_ is/are objected to.

9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 22February2021 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a) ☒ All b) ☐ Some\*\* c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

3) ☐ Interview Summary (PTO-413)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)

Paper No(s)/Mail Date \_\_\_\_.

4) ☐ Other: \_\_\_\_.

Paper No(s)/Mail Date \_\_\_\_.

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## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Response to Amendment***

This office action is responsive to the Preliminary amendment filed on December 17, 2021. As directed by the amendment: claims 1, 2, 4-9, 13-16, 18-22, 24, 25, 28-30 have been amended, claims 23, 26, and 27 have been cancelled, and claims 31-33 have been added. Thus, claims 1-22, 24, 25, and 28-33 are presently pending in this application.

### ***Claim Objections***

**Claims 14, 28, and 29** are objected to because of the following informalities:

**Regarding claim 14**, the claim should be amended to recite “in which the milk container” in line 1 to correct for grammar.

**Regarding claim 28**, it is recommended to amend the claim to recite that “the pump is configured to deliver in excess...” to clarify that the feature is a functional aspect of the pump.

**Claim 29** should end in a period.



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Appropriate correction is required.

### ***Claim Interpretation***

The preamble in claim 1 recites “A breast pump device that is configured as a self-contained, in-bra wearable device”. The examiner notes that this limitation gives life and meaning to the claim since it sets forth structural limitations to the overall breast pump device. For examination purposes, the term “self-contained, in-bra wearable device’ is interpreted to mean “complete, or having all that is needed, in itself’ and is capable of being worn in a bra. Applicant's disclosure appears to support this interpretation in fig. 1 of the Drawings which shows a fully complete breast pump device which is capable of being worn in a bra due to the device being self-contained.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1-3, 6-8, 10, 11, 14, 16-18, 22, 24, and 31 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers (US 20080275386) and in further view of Barack (US 20140378895).**

**Regarding claim 1**, Myers discloses a breast pump device that is configured as a self-contained, in-bra wearable device (breast pump 10 in fig. 1), comprising:

- (i) a housing (outer housing 16 in fig. 1) that includes (a) a battery (AA battery 51 in fig. 10), and (b) a pump generating negative air pressure (motor 54 in fig. 10);
- (ii) a breast shield (breast cup 16 in fig. 1) being configured to slide in and out of the housing (paragraph 58 discloses that the cup “clicks” into place within the housing; paragraph 42 discloses the breast cup being removable), the breast shield made up of a breast flange (outer flange area 50 in fig. 5) and a nipple tunnel (nipple tunnel 46 in fig. 5), in which the breast shield is transparent or optically clear (paragraph 65); and
- (iii) a milk container that is configured to be attached to and removed from the housing (collection bag 28 is shown to be operatively attached to the housing and is physically engaged to the bottom portion of the housing).

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However, Myers does not teach or disclose the breast shield being of a plurality of interchangeable breast shields each having a different size.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield of modified Khalil to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

**Regarding claim 2**, in the modified device of Myers, Barack discloses the plurality of interchangeable breast shields each provide a different spacing of a nipple from side walls of the nipple tunnel when that breast shield has been placed onto a breast (paragraph 54).

**Regarding claim 3**, in the modified device of Myers, Myers discloses the breast shield is rigid (paragraph 47 discloses the nipple tunnel, which is part of the breast shield, is rigid).

**Regarding claim 6**, in the modified device of Myers, Myers discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Myers is

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functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

**Regarding claim 7**, in the modified device of Myers, Myers discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 9A/B shows a singular inner surface which would extend from the nipple to the breast).

**Regarding claim 8**, in the modified device of Myers, Myers discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 5 shows a singular item).

**Regarding claim 10**, in the modified device of Myers, Myers discloses the breast shield is configured to slide into the housing with a single push action (paragraph 58 discloses the shield can click into place).

**Regarding claim 11**, in the modified device of Myers, Myers discloses the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump (flange top 36 in fig. 9A).

**Regarding claim 14**, in the modified device of Myers, Myers discloses milk container attaches to a lower part of the housing (fig. 1 shows a part of the collection bag attached to the bottom part of the housing 16) and forms a base of the breast pump device (fig. 1).

**Regarding claim 16**, in the modified device of Myers, Myers discloses the nipple tunnel includes guide lines running parallel along one or more sides of the nipple tunnel (detent tabs 52a/b in fig. 15 are shown to be extending in a parallel to the width direction of the nipple tunnel sides).

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**Regarding claim 17**, in the modified device of Myers, Myers discloses the nipple tunnel includes an air hole or passage (24 in fig. 9A), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (paragraph 52).

**Regarding claim 18**, in the modified device of Myers, Myers discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (outlet 24 in fig. 9A).

**Regarding claim 22**, in the modified device of Myers, Myers discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 1; paragraph 40).

**Regarding claim 24**, in the modified device of Myers, Myers discloses the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg (paragraph 72).

**Regarding claim 31**, modified Myers teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (paragraph 54 of Barack).

**Claim 4 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers in view of Barack, as applied to claim 1 above, and further in view of Phillips (US 20160296682), as evidenced by Yuen (US 20050228342).**

**Regarding claim 4**, modified Myers teaches all of the claimed limitations set forth in claim 1, as discussed above. Myers further teaches the breast shield is made from plastic (paragraph 40 discloses the breast cup being made from silicone, which is a type of plastic, as evidenced by Yuen in paragraph 24). However, modified Myers does not teach or disclose breast shield is dishwasher safe.

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Phillips teaches a breast pump device (fig. 1) comprising a breast shield (110 in fig. 1). Phillips further teaches that the shield can be washed in a dishwasher (paragraph 60). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Myers to be dishwasher safe for the purpose of enabling the shield to be cleaned in the dishwasher for reuse, as taught by Phillips (paragraph 60).

**Claims 1, 2, 6-10, 14, 17, 18, 20-22, and 31 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil (US 20130023821) in view of Myers (US 20080275386) and in further view of Barack (US 20140378895).**

**Regarding claim 1**, Khalil discloses a breast pump device that is configured as a self-contained, in-bra wearable device (figs. 9-11), comprising:

(i) a housing (6' and 6" form a housing as shown in fig. 9) that includes (a) a power source (paragraph 32 discloses the power source integrated into the housing), and (b) a pump generating negative air pressure (vacuum pump 81 in fig. 10);

(ii) a breast shield (breast interface 1 in fig. 11) being configured to slide in and out of the housing (breast interface 1 is configured to slide in/out from the housing by attaching/detaching the lip 11 to the flange 62 of the housing as shown in fig. 4), the breast shield made up of a breast flange (base part 12 in fig. 4) and a nipple tunnel (stub 10 in fig. 4); and

(iii) a milk container that is configured to be attached to and removed from the housing (milk collection container 7' in fig. 11; paragraph 69 discloses the container being releasably connected to the housing part 6').

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However, Khalil does not teach or disclose the power source being a battery and the breast shield being of a plurality of interchangeable breast shields each having a different size and each breast shield being transparent or optically clear.

Myers teaches a similar breast pump system (fig. 1) having a housing (outer housing 16 in fig. 1) which comprises a battery (battery 52 in fig. 10) and a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device and to have made the breast shield transparent to enable a user to view the condition of a nipple (paragraph 65).

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield of modified Khalil to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

**Regarding claim 2**, in the modified device of Khalil, Barack discloses the plurality of interchangeable breast shields each provide a different spacing of a nipple

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from side walls of the nipple tunnel when that breast shield has been placed onto a breast (paragraph 54).

**Regarding claim 6**, in the modified device of Khalil, Khalil discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Khalil is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

**Regarding claim 7**, in the modified device of Khalil, Khalil discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 11).

**Regarding claim 8**, in the modified device of Khalil, Khalil discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 11).

**Regarding claim 9**, in the modified device of Khalil, Khalil discloses the breast shield is generally symmetrical about a centre-line running from a top to a bottom of the breast shield when positioned upright for normal use (fig. 11).

**Regarding claim 10**, in the modified device of Khalil, Khalil discloses the breast shield is configured to slide into the housing with a single push action (the shield of Khalil is functionally capable of being pushed into the housing so that the nipple tunnel is located in the housing).

**Regarding claim 14**, in the modified device of Khalil, Khalil discloses milk container attaches to a lower part of the housing and forms a base of the breast pump device (fig. 9).



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**Regarding claim 17**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes an air hole or passage (opening 13 in fig. 3), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (figs. 4 and 5).

**Regarding claim 18**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (opening 13 in fig. 3 is considered to be on a “lower” surface of the nipple tunnel since “lower” is not further defined; see fig. 5).

**Regarding claim 20**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing further includes a Universal Serial Bus (USB) charging socket.

As discussed above, Barack is directed towards a breast pump device (fig. 1) which comprises a housing which houses a pump (fig. 1 shows a pump 20 which would necessarily have some sort of housing since it is disclosed to have a USB port and a user interface). Barack further teaches a USB charging socket (USB port 34 in fig. 1; paragraph 45). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include the USB charging socket, as taught by Khalil, for the purpose of enabling the device to interface with an external memory (paragraph 45).

**Regarding claim 21**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing includes a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track

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pumping sessions, to indicate whether that particular session is associated with a left or a right breast.

Barack teaches a breast pump device (fig. 1) which has a control electronics (controller 22 in fig. 1) and a control interface (user interface 30 in fig. 1) that is user selectable to indicate or record if milk is being expressed from the left or right breast (paragraph 43) and that, when selected for a particular pumping session, sends data to a connected application, running on a device, such as a smartphone, that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast (paragraph 46 discloses transmitting via transceiver the parameters that have been entered at the user interface 30 to a remote device; paragraph 43 discloses that one parameter entered at the user interface is which breast is selected).

Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast, as taught by Barack. This modification would enable a user to track which parameters are best suited for each breast to optimize pumping, as taught by Barack (paragraphs 8 and 43).

**Regarding claim 22**, in the modified device of Khalil, Khalil discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 9).

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**Regarding claim 31**, modified Khalil teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (paragraph 54 of Barack).

**Claim 5 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Chang (US 20180333523).**

**Regarding claim 5**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast shield is configured to attach using magnets to the housing.

Chang teaches a substantially similar self-contained breast pump system (breast pump system 10 in fig. 1A) having a breast shield (flange 14 in fig. 1A) attached to a housing (housing 12 in fig. 1A) and configured to attach to the housing using one or more magnets (paragraph 108 discloses the shield uses magnets 118 attached to the shield to determine if the shield is properly attached to the housing). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Khalil to be configured to attach using magnets to the housing since Chang teaches this configuration provides a safeguard such that the system will not operate unless all components are fully connected (paragraph 108).

**Claims 12 and 13 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Phillips (US 20160296682).**

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**Regarding claim 12**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Although it appears based on fig. 11 of Khalil that the container would be rigid, modified Khalil does not explicitly teach or disclose this limitation.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is substantially rigid (paragraph 57 discloses the container being made from Tritan; pg. 21 of Applicant's specification discloses that Tritan is a polycarbonate material, which is a known rigid material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Regarding claim 13**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further discloses the milk container is an optically clear, plastic container (paragraph 69 discloses the container is made of plastic like cover 6" and is transparent in its entirety). However, Khalil does not explicitly teach or disclose the milk container is dishwasher safe.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is dishwasher safe (paragraph 57 discloses the container being made from Tritan; pg. 21, lines 13-18 of Applicant's specification discloses that Tritan a dishwasher safe material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the

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purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Claim 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Karsan (US 20070228059).**

**Regarding claim 15**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the milk container is configured to magnetically attach to the housing.

Khalil teaches that the milk container latches to the housing by a locking lug (paragraph 69 discloses a locking lug formed on the container latches engages into a corresponding recess). Karsan teaches a container (1 in fig. 1) having a case (2 in fig. 3) and a base (fig. 3) which are releasably held together (paragraph 51 discloses the connection being releasable) via a latch mechanism (5 and 6 in fig. 3). Karsan further teaches that the latching mechanism is embodied as a lug and recess (5 and 6, respectively in fig. 3; paragraph 65) but may alternatively be embodied as a magnetic means so that the two components may be magnetically latched (paragraph 65).

In Applicant's invention, Applicant uses the magnets to removably secure the milk container to the housing. Thus, Karsan is reasonably pertinent to the problem faced by the inventor since Karsan teaches using magnets as a removable latching connection between two components. As Karsan teaches that the magnetic means (paragraph 65) are functional equivalents to a locking lug and recess (paragraph 65), it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have substituted the locking lug/recess configuration of Khalil with

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the magnetic means, as taught by Karsan. The substitution would have resulted in providing an equivalent secure attachment of the milk container to the housing.

**Claim 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Blondheim (US 20120277636).**

**Regarding claim 19**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump comprises one or more piezo air pumps.

Blondheim is directed towards a breast pump device (fig. 1) which comprises an air pump (66 in fig. 6). Blondheim further teaches that the air pump can be a piezoelectric pump (paragraph 36). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the pump of modified Khalil to be a piezoelectric pump, as taught by Blondheim for the purpose of rendering the pump small in size (paragraph 36).

**Claim 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Guthrie (US 20160220743).**

**Regarding claim 25**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device includes a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.

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Guthrie is directed towards a breast pump device comprising a sensor (detector 607 in fig. 6B) that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container (paragraph 63 discloses that the emitter 606 and the detector 607 operate to detect light reflecting off the opaque surface of the milk). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device to include a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container, as taught by Guthrie, for the purpose of measuring volume of milk pumped (paragraph 54).

**Claim 29 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Mendoza (US 6227936).**

**Regarding claim 29**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump is a lightweight air pump that enables the total mass of the breast pump system, unfilled with milk, to be less than 250gm.

Mendoza teaches a bra which is designed to support a breast pump to allow the mother's hands to remain free (1:8-12). Mendoza further discloses that the bra must be able to support up to 8 ounces when the pump is full (1:58-62). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed

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invention to have modified the system of modified Khalil to be a lightweight air pump that enables the total weight of the system, unfilled with milk, to be less than 250gm, as taught by Mendoza since Mendoza teaches that a lightweight system is crucial for enabling the system to be supported by a bra.

**Claim 30 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, in further view of Baker (US 20090281485).**

**Regarding claim 30**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

Baker is directed towards a device for removing fluid from a body (fig. 6) using a vacuum pump embodied as a motor (motor 9 in fig. 6; paragraph 243). Baker further teaches that the device makes less than 20 decibel of noise at full power (paragraph 121) by sound proofing the walls of the housing and by adding a counter balance to the motor (paragraph 144). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device of modified Khalil to have the device make less than 20 dB of noise during maximum power for the purpose of making the device for discrete and comfortable for the user and others around the user.

**Claim 32 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 31 above, in further view of Cudworth (US 20120165729).**



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**Regarding claim 32**, modified Khalil teaches all of the claimed limitations set forth in claim 31, as discussed above, but does not teach or disclose each of the plurality of interchangeable breast shields includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.

Cudworth teaches a breast pump system (fig. 1) having a shield (attachment 1) having a flange (cup 2 in fig. 2) and a nipple tunnel (cylindrical portion 3 in fig. 1). Cudworth further teaches the nipple tunnel includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (grooves 12 in fig. 1 are functionally capable of serving as “fit lines” to assist a user in determining if the breast shield is correctly sized and since the claimed fit lines are not further structurally defined). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of Khalil to include the claimed fit lines, as taught by Cudworth, for the purpose of providing a massaging pressure on the breast to help stimulate milk production (paragraph 30).

**Claim 33 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, in further view of Meyers (US 5542921).**

**Regarding claim 33**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further teaches control electronics (“control

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elements and a display” in paragraph 51) which would be powered by the battery (the power source of Khalil is understood to power the device).

However, Khalil does not teach or disclose the battery to be rechargeable and the housing further including a power charging circuit for controlling the charging of the rechargeable battery.

Meyers is directed to a breast pump device (fig. 1) comprising a battery configured to be recharged (9:50-52 discloses recharging the batteries) and a power charging circuit for controlling the charging of the rechargeable battery (“circuit” in 9:50-52). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the battery of modified Khalil to be rechargeable and to have incorporated a power charging circuit for controlling the charging of the rechargeable battery, as taught by Meyers to enable the batteries to be reused.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed.

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Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit [www.uspto.gov/patent/patents-forms](http://www.uspto.gov/patent/patents-forms). The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to [www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp](http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp).

**Claims 1-22, 24, 25, 29-33 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of U.S. Patent No. 10881766 in view of Khalil, Myers, Barack, and the teachings below (see table).**

**Regarding claim 1**, claim 1 of the issued patent claims all of the claimed limitations of instant claim 1 except the device being a self-contained, in-bra device having a breast shield being substantially rigid and formed from dishwasher safe plastic.

Khalil teaches a breast pump device (fig. 10) configured as a self-contained, in-bra wearable device (fig. 10; paragraph 70). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the reference claim to be a self-contained, in-bra wearable device, as taught by Khalil, for the purpose of enabling the device to be a small and hands-free (paragraph 70).

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65).

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may

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change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5	8	
6		Myers and Khalil teach this limitation above.
7	7	
8	27	
9		Khalil teaches this limitation above.
10	8	
11		Myers teaches this limitation above.
12		Philips teaches this limitation above.
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15	2	
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	18	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25	26	
29		Mendoza teaches this limitation above.
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

**Claims 1-22, 24, 25, and 28-33 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of U.S. Patent No. 10926011 in view of Khalil, Myers, and Barack, and the teachings below (see table).**

**Regarding claim 1**, claim 1 of the issued patent claims all of the limitations in instant claim 1 except claim 1 does not claim a self-contained device, the housing having a battery, the breast shield having a breast flange and nipple tunnel and being substantially rigid and formed of an optically clear, dishwasher safe plastic and being configured to slide into the housing and the milk container being configured for attachment and removal from the housing.

Khalil teaches a breast pump device (fig. 10) configured as a self-contained, in-bra wearable device (fig. 10; paragraph 70) having a breast shield (1 in fig. 11) having a flange (12 in fig. 6) and a nipple tunnel (13 in fig. 6) and a milk container (7' in fig. 11) configured to be attached and removed from the housing (paragraph 69). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the reference claim to be a self-contained, in-bra wearable device having a breast shield with a flange and nipple tunnel and a milk container configured to be attached and removed from the housing, as taught by Khalil, for the purpose of enabling the device to be a small and hands-free (paragraph 70). The modification of the breast shield would enable the shield to interface with the breast and receive the nipple and the modification of the milk container would enable the milk to be collected after expression.

Myers teaches a self-contained, in bra breast pump (fig. 1) which comprises a breast shield (18 in fig. 2) having a flange (48 in fig. 5) and nipple tunnel (46 in fig. 5) and a housing (16 in fig. 2) for housing a pump (56 in fig. 10) and a battery for powering the pump (52 in fig. 10). Myers further teaches that the breast shield is optically clear (paragraph 65). Therefore, it would have been obvious to one of ordinary skill before

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the effective filing date of the claimed invention to have modified the shield to be optically clear for the purpose of allowing a user to visualize the placement of the breast and nipple and to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6		Myers and Khalil teach this limitation above.
7	30	
8		Myers and Khalil teach this limitation above.
9		Khalil teaches this limitation above.
10	14	
11		Myers teaches this limitation above.
12	12	
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.

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15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	1	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25	19	
28	9	
29	28	
30	10	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203050 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph



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65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	6	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	7	
7	8	
8	9	
9	11	
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12		Philips teaches this limitation above.
13		Philips teaches this limitation above.
14	20	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.

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19	2	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22	21	
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28	4	
29	4	
30	5	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203079 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph

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65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6		Myers and Khalil teach this limitation above.
7		Myers and Khalil teach this limitation above.
8		Myers and Khalil teach this limitation above.
9		Khalil teaches this limitation above.
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12		Philips teaches this limitation above.
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.

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19		Blondheim teaches this limitation above.
20		Barack teaches this limitation above.
21	1	
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
29		Mendoza teaches this limitation above.
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33	31	

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203109 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

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Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	20	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	21	
7	22	
8	22	
9		Khalil teaches this limitation above.
10		Myers and Khalil teach this limitation above.
11	23	
12	29	
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	6	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.

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24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28	18	
29		Mendoza teaches this limitation above.
30	19	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203150 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each

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having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

This is a provisional nonstatutory double patenting rejection.

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	2	
4		Philips teaches this limitation above.
5	1	
6	3	
7	4	
8	6	
9	7	
10		Myers and Khalil teach this limitation above.
11	8	
12	15	
13		Philips teaches this limitation above.
14	16	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18	23	
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22	17	

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24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28	29	
29	29	
30	30	Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203179 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several



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breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	10	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	11	
7	12	
8	13	
9	15	
10		Myers and Khalil teach this limitation above.
11	16	
12	2	
13		Philips teaches this limitation above.
14	3	
15	1	
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18	23	
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28	29	
29	29	
30	30	

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31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203216 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of

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ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6		Myers and Khalil teach this limitation above.
7		Myers and Khalil teach this limitation above.
8		Myers and Khalil teach this limitation above.
9		Khalil teaches this limitation above.
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12		Philips teaches this limitation above.
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19		Blondheim teaches this limitation above.
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25	1	
29		Mendoza teaches this limitation above.
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33	31	

This is a provisional nonstatutory double patenting rejection.

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**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203259 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may

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change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6		Myers and Khalil teach this limitation above.
7		Myers and Khalil teach this limitation above.
8		Myers and Khalil teach this limitation above.
9		Khalil teaches this limitation above.
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12	22	
13		Philips teaches this limitation above.
14	23	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25	13	
29	29	
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33	31	

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1 and 31 of copending Application No. 17/203292 in view of the teachings below.**

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**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
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1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	3	
7	4	
8	5	
9	7	
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12	12	
13		Philips teaches this limitation above.
14	16	
15		Karsan teaches this limitation above.
16	1	
17		Myers and Khalil teach this limitation above.
18	23	
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24	32	
25		Guthrie teaches this limitation above.
28	29	
29	29	
30	30	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 28-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203313 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or

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optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	16	
4		Philips teaches this limitation above.



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5		Chang teaches this limitation above.
6	17	
7	18	
8	18	
9	19	
10		Myers and Khalil teach this limitation above.
11	20	
12	27	
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	1	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28	13	
29	14	
30	15	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203327 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

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Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	3	
7	4	

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8	4	
9	7	
10		Myers and Khalil teach this limitation above.
11	8	
12	15	
13		Philips teaches this limitation above.
14	16	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18	23	
19		Blondheim teaches this limitation above.
20	1	
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
29		Mendoza teaches this limitation above.
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203355 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses

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the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	2	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	3	
7	4	
8	5	
9	7	
10		Myers and Khalil teach this limitation above.
11	8	
12	15	
13		Philips teaches this limitation above.

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14	16	
15		Karsan teaches this limitation above.
16	1	
17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22	17	
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
28		
29	30	
30	31	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33	32	

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203384 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast

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shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3		Myers teaches this limitation above.
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6		Myers and Khalil teach this limitation above.
7		Myers and Khalil teach this limitation above.
8		Myers and Khalil teach this limitation above.
9		Khalil teaches this limitation above.
10		Myers and Khalil teach this limitation above.
11		Myers teaches this limitation above.
12		Philips teaches this limitation above.
13		Philips teaches this limitation above.
14		Myers and Khalil teach this limitation above.
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.

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17		Myers and Khalil teach this limitation above.
18		Myers and Khalil teach this limitation above.
19		Blondheim teaches this limitation above.
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
29		Mendoza teaches this limitation above.
30		Baker teaches this limitation above.
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33	29	

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203397 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

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Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	1	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	3	
7	4	
8	5	
9	7	
10		Myers and Khalil teach this limitation above.
11	8	
12	15	
13	32	
14	16	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18	23	
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.



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24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
29	30	
30	31	
31		Barack teaches this limitation above.
32		Cudworth teaches this limitation above.
33		Meyers teaches this limitation above.

This is a provisional nonstatutory double patenting rejection.

**Claims 1-22, 24, 25, 29-33 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of copending Application No. 17/203418 in view of the teachings below.**

**Regarding claim 1**, the independent claim(s) claim all of the limitations of instant claim 1 except in that the claim(s) does not claim the breast shield is transparent or optically clear and is of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Barack is directed to a breast pump device (fig. 1) having a breast shield (breast shield 12 in fig. 1) which is a part of a plurality of interchangeable breast shields each having a different size (paragraph 54 discloses the device is provided with several

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breast shields which are each configured to be used with a singular breast pump device and have their own tunnel size). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be a part of a plurality of interchangeable breast shields each having a different size, as taught by Barack, since Barack teaches that a user's nipples may change in size during the course of nursing which would necessitate a different shield (paragraph 54).

App Claim	Ref Claim	Teaching
1		See discussion above
2		Barack teaches this limitation above.
3	2	
4		Philips teaches this limitation above.
5		Chang teaches this limitation above.
6	3	
7	4	
8	5	
9	7	
10		Myers and Khalil teach this limitation above.
11	8	
12	1	
13	1	
14	16	
15		Karsan teaches this limitation above.
16		Myers teaches this limitation above.
17		Myers and Khalil teach this limitation above.
18	23	
19	28	
20		Barack teaches this limitation above.
21		Barack teaches this limitation above.
22		Myers and Khalil teach this limitation above.
24		Myers teaches this limitation above.
25		Guthrie teaches this limitation above.
29	30	
30	31	
31		Barack teaches this limitation above.

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32		Cudworth teaches this limitation above.
33	32	

This is a provisional nonstatutory double patenting rejection.

### ***Allowable Subject Matter***

Except for the double patenting rejection above, **claim 28** would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not teach or suggest the pump delivers the claimed stall pressure and free air flow.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to COURTNEY FREDRICKSON whose telephone number is (571)270-7481. The examiner can normally be reached Monday-Friday (9 AM - 5 PM EST).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NATHAN PRICE can be reached on 571-270-5421. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/COURTNEY B FREDRICKSON/  
Examiner, Art Unit 3783

/NATHAN R PRICE/  
Supervisory Patent Examiner, Art  
Unit 3783

<b><i>Notice of References Cited</i></b>	Application/Control No. 17/181,057		Applicant(s)/Patent Under Reexamination O'TOOLE et al.	
	Examiner COURTNEY FREDRICKSON		Art Unit 3783	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5542921-A	08-1996	Meyers; Brenda J.	A61M1/062	604/74
*	B	US-6227936-B1	05-2001	Mendoza; Amelia	A41C3/04	2/104
*	C	US-20070228059-A1	10-2007	Karsan; Chettan	B65D43/16	220/824
*	D	US-20080275386-A1	11-2008	Myers; Kenneth E.	A61M1/81	604/74
*	E	US-20090281485-A1	11-2009	BAKER; PETER CHRISTENSEN	A61B17/24	604/35
*	F	US-20120165729-A1	06-2012	Cudworth; Nicholas	A61J13/00	604/74
*	G	US-20120277636-A1	11-2012	Blondheim; David Simeon	A61B5/742	600/595
*	H	US-20130023821-A1	01-2013	KHALIL; Gamal	A61M1/82	604/74
*	I	US-20140378895-A1	12-2014	Barack; Doron	A61M1/06	604/74
*	J	US-20160220743-A1	08-2016	Guthrie; Gabrielle V.	G16H40/63	1/1
*	K	US-20160296682-A1	10-2016	Phillips; Andrew Luke	A61J13/00	1/1
*	L	US-20180333523-A1	11-2018	Chang; John	A61M1/06	1/1
	M					


**FOREIGN PATENT DOCUMENTS**

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	N					
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**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC - Searched*		
Symbol	Date	Examiner
a61m1/06-069	01/12/2022	cbf

CPC Combination Sets - Searched*		
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US Classification - Searched*			
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Search Notes		
Search Notes	Date	Examiner
see SEARCH history	01/12/2022	cbf
searched inventors in PALM and SEARCH	01/12/2022	cbf
consulted child search history	01/12/2022	cbf

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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<b><i>Index of Claims</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
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✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
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CLAIMS										
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CLAIM		DATE								
Final	Original	01/12/2022								
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	3	✓								
	4	✓								
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	31	✓								
	32	✓								
	33	✓								

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Attorney Docket Number

373499.00049

**U.S.PATENTS**[Remove](#)

Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	2849881	A	1958-09-02	ANDERSON	
	2	4390024	A	1983-06-28	WILLIAMS	
	3	4535627	A	1985-08-20	PROST, et al.	
	4	5474683	A	1995-12-12	BRYANT, et al.	
	5	5941847	A	1999-08-24	HUBER, et al.	
	6	5973770	A	1999-10-26	CARTER, et al.	
	7	6045529	A	2000-04-04	NUEESCH	
	8	6090065	A	2000-07-18	GILES	



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Application Number		
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Attorney Docket Number	373499.00049	

9	6227936	B1	2001-05-08	MENDOZA	
10	6328709	B1	2001-12-11	HUNG, et al.	
11	6358226	B1	2002-03-19	RYAN	
12	6383163	B1	2002-05-07	KELLY, et al.	
13	6440100	B1	2002-08-27	PRENTISS	
14	6461324	B1	2002-10-08	SCHLENSOG	
15	6547756	B1	2003-04-15	GRETER, et al.	
16	6579258	B1	2003-06-17	ATKIN, et al.	
17	6663587	B2	2003-12-16	SILVER, et al.	
18	6749582	B2	2004-06-15	BRITTO, et al.	
19	7048519	B2	2006-05-23	FONG, et al.	

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20	7201735	B2	2007-04-10	ATKIN, et al.
21	D548831	S	2007-08-14	CHARLEZ
22	7312554	B2	2007-12-25	VOGELEY
23	7314400	B2	2008-01-01	FILDAN, et al.
24	7662018	B1	2010-02-16	THOMPSON
25	7776008	B2	2010-08-17	RENZ, et al.
26	8057425	B1	2011-11-15	MYERS, et al.
27	8118772	B2	2012-02-21	DAO, et al.
28	8187227	B2	2012-05-29	LUZBETAK, et al.
29	8262606	B2	2012-09-11	GRETER, et al.
30	8282596	B2	2012-10-09	GRETER, et al.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
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31	8376986	B2	2013-02-19	VAN, et al.
32	8702646	B2	2014-04-22	GARBEZ, et al.
33	8801495	B1	2014-08-12	GUINDON
34	8876760	B2	2014-11-04	BOSMAN, et al.
35	8926556	B2	2015-01-06	VAN EIJKELNBORG, et al.
36	9033913	B2	2015-05-19	KHALIL, et al.
37	9173587	B2	2015-11-03	VAN SCHIJNDEL, et al.
38	9345274	B1	2016-05-24	PRILL
39	9539377	B2	2017-01-10	MAKOWER, et al.
40	10039871	B2	2018-08-07	POLLEN, et al.

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Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20020193731	A1	2002-12-19	MYERS, et al.	
	2	20040056641	A1	2004-03-25	MYERS, et al.	
	3	20040074281	A1	2004-04-22	LOBDELL, et al.	
	4	20040267215	A1	2004-12-30	CHARLEZ, et al.	
	5	20050219302	A1	2005-10-06	VOGELEY, et al.	
	6	20060122575	A1	2006-06-08	WAKABAYASHI	
	7	20070051172	A1	2007-03-08	PERINET, et al.	
	8	20070051727	A1	2007-03-08	HOLLEY	
	9	20080177224	A1	2008-07-24	KELLY, et al.	
	10	20080262420	A1	2008-10-23	DAO, et al.	

**INFORMATION DISCLOSURE  
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( Not for submission under 37 CFR 1.99)

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Examiner Name		
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11	20080275386	A1	2008-11-06	MYERS	
12	20110004154	A1	2011-01-06	VAN, et al.	
13	20110196291	A1	2011-08-11	VISCHER, et al.	
14	20110274566	A1	2011-11-10	AMIROUCHE, et al.	
15	20120277636	A1	2012-11-01	BLONDHEIM, et al.	
16	20130023821	A1	2013-01-24	KHALIL, et al.	
17	20140031744	A1	2014-01-30	CHEN	
18	20140052056	A1	2014-02-20	GARBEZ, et al.	
19	20140275857	A1	2014-09-18	TOTH, et al.	
20	20140323962	A1	2014-10-30	KOOIJKER, et al.	
21	20140378895	A1	2014-12-25	BARACK	

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373499.00049

22	20150217036	A1	2015-08-06	POLLEN, et al.
23	20150217037	A1	2015-08-06	POLLEN, et al.
24	20150283311	A1	2015-10-08	ALVAREZ, et al.
25	20160000980	A1	2016-01-07	ALVAREZ, et al.
26	20160058928	A1	2016-03-03	NOWROOZI, et al.
27	20160058929	A1	2016-03-03	MEDVEDEV, et al.
28	20160082165	A1	2016-03-24	ALVAREZ, et al.
29	20160082166	A1	2016-03-24	GUTHRIE, et al.
30	20160151551	A1	2016-06-02	FELBER
31	20160158424	A1	2016-06-09	CHEN, et al.
32	20160166745	A1	2016-06-16	AALDERS

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STATEMENT BY APPLICANT**  
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Application Number		
Filing Date		
First Named Inventor	Jonathan O'Toole	
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Examiner Name		
Attorney Docket Number	373499.00049	

33	20160206794	A1	2016-07-21	MAKOWER, et al.	
34	20160220743	A1	2016-08-04	GUTHRIE, et al.	
35	20160220745	A1	2016-08-04	GUTHRIE, et al.	
36	20160256617	A1	2016-09-08	HANSEN	
37	20160287767	A1	2016-10-06	SIMMONS, et al.	
38	20160296681	A1	2016-10-13	GASKIN, et al.	
39	20160310650	A1	2016-10-27	MAKOWER, et al.	
40	20170021068	A1	2017-01-26	GASKIN, et al.	
41	20170035951	A1	2017-02-09	TANAKA	
42	20170043065	A1	2017-02-16	TAKEUCHI	
43	20170072117	A1	2017-03-16	KURIHARA, et al.	

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
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44	20170072118	A1	2017-03-16	MAKOWER, et al.
45	20170143879	A1	2017-05-25	OKAGUCHI
46	20170220753	A1	2017-08-03	GUTHRIE, et al.
47	20180021490	A1	2018-01-25	CHANG, et al.
48	20180110906	A1	2018-04-26	BARACK

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	1	3311982	DE	C2	1983-10-13	BATTELLE MEMORIAL INSTITUTE		
	2	9503280	EP	A2	1992-02-08	PIERBURG GMBH		
	3	9420158	WO	A1	1994-09-15	DEKA PRODUCTS LIMITED PARTNERSHIP		
	4	19750620	DE	A1	1999-06-02	SIEMENS AG, 80333 MUENCHEN, DE		



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STATEMENT BY APPLICANT**  
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5	1586340	EP	A2	2005-10-19	SEA PROFIT (HONG KONG) LIMITED		
6	2005114116	WO	A1	2005-12-01	LANE, JOHN, DENNIS; ESPARZA, JOSEPH, LUIS; NICHOLS		
7	2005114113	WO	A3	2006-03-02	ACCU-GAUGE LIMITED		
8	1430918	EP	B1	2008-05-14	MEDELA HOLDING AG		
9	2344380	RU	C1	2009-01-20	GOSUDARSTVENNOE OBRAZOVATEL'NOE UCHREZHDENIE VYSSH		
10	2009134271	WO	A1	2009-11-05	UTC POWER CORPORATION		
11	2473022	GB	B	2011-12-14			
12	2441367	RU	C2	2012-02-10	OBSHCHESTVO S OGRANICHENNOJ OTVETSTVENNOST'JU 'NAU		
13	2436277	EP	A1	2012-04-04	DREW, LORNA		
14	2210628	EP	B1	2013-02-13	MEDELA HOLDING AG		
15	2499248	GB	B	2014-04-02	ELIZABETH MORANA		

**INFORMATION DISCLOSURE  
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( Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Jonathan O'Toole
Art Unit	
Examiner Name	
Attorney Docket Number	373499.00049

16	1404393	EP	B1	2014-12-24	MEDELA HOLDING AG		
17	2015081459	WO	A1	2015-06-11	CHEN, JUNBO		
18	2015116749	WO	A1	2015-08-06	CORNING INCORPORATED		
19	2015120321	WO	A1	2015-08-13	NAIA HEALTH, INC.		
20	2015150225	WO	A1	2015-10-08	KONINKLIJKE PHILIPS N.V.		
21	2015174330	WO	A1	2015-11-19	MURATA MANUFACTURING CO., LTD.		
22	2016002606	WO	A1	2016-01-07	MURATA MANUFACTURING CO., LTD.		
23	2016006494	WO	A1	2016-01-14	MURATA MANUFACTURING CO., LTD.		
24	2016006496	WO	A1	2016-01-14	MURATA MANUFACTURING CO., LTD.		
25	2016007560	WO	A1	2016-01-14	NAYA HEALTH, INC.		
26	2016010524	JP	A	2016-01-21	MURATA MFG CO LTD		

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Application Number	
Filing Date	
First Named Inventor	Jonathan O'Toole
Art Unit	
Examiner Name	
Attorney Docket Number	373499.00049

27	2016014469	WO	A1	2016-01-28	EXPLORAMED NC7, LLC		
28	2016014488	WO	A1	2016-01-28	EXPLORAMED NC7, LLC		
29	105288759	CN	A	2016-02-03	SHANGHAI NORMAL UNIVERSITY		
30	2016024558	WO	A1	2016-02-18	MURATA MANUFACTURING CO., LTD.		
31	2016039083	WO	A1	2016-03-17	MURATA MANUFACTURING CO., LTD.		
32	2016104673	WO	A1	2016-06-30	MURATA MANUFACTURING CO., LTD.		
33	2077868	EP	B1	2016-07-27	MEDELA HOLDING AG		
34	2016164853	WO	A1	2016-10-13	NAYA HEALTH, INC.		
35	1263487	EP	B2	2016-11-23	MEDELA HOLDING AG		
36	2017061349	WO	A1	2017-04-13	MURATA MANUFACTURING CO., LTD.		
37	2017108555	WO	A1	2017-06-29	KONINKLIJKE PHILIPS N.V.		

# INFORMATION DISCLOSURE STATEMENT BY APPLICANT

( Not for submission under 37 CFR 1.99)

Application Number

Filing Date

First Named Inventor

Jonathan O'Toole

Art Unit

Examiner Name

Attorney Docket Number

373499.00049

	38	2017139480	WO	A1	2017-08-17	EXPLORAMED NC7, INC.		
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	Whisper Wear Hands-Free Breast Pump, Model: WWMP01, User Guide, pps. 1-20, Distributed with product at least as early as 2007 (see <a href="https://web.archive.org/web/20070621162539/http://www.whisperwear.com/pump_single.html">https://web.archive.org/web/20070621162539/http://www.whisperwear.com/pump_single.html</a> )	

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<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

<sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

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( Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Jonathan O'Toole
Art Unit	
Examiner Name	
Attorney Docket Number	373499.00049

## CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Mark D. Simpson/	Date (YYYY-MM-DD)	2021-02-22
Name/Print	Mark D Simpson	Registration Number	32942

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number	17181057
Filing Date	2021-02-22
First Named Inventor	Jonathan O'Toole
Art Unit	3783
Examiner Name	
Attorney Docket Number	373499.00049

**U.S.PATENTS**

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	5542921	A	1996-08-06	MEYERS, et al.	
	2	7833190	B1	2010-11-16	HALL	

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	1	20070135761	A1	2007-06-14	CHENG, et al.	
	2	20070179439	A1	2007-08-02	VOGELIN, et al.	
	3	20090281485	A1	2009-11-12	BAKER, et al.	
	4	20110009824	A1	2011-01-13	YODFAT, et al.	

# **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ( Not for submission under 37 CFR 1.99)

Application Number	17181057
Filing Date	2021-02-22
First Named Inventor	Jonathan O'Toole
Art Unit	3783
Examiner Name	
Attorney Docket Number	373499.00049

5	20160271305	A1	2016-09-22	KURIHARA, et al.
6	20160296682	A1	2016-10-13	PHILLIPS, et al.
7	20160325031	A1	2016-11-10	MILLER, et al.
8	20170095599	A1	2017-04-06	KONDO, et al.
9	20170112983	A1	2017-04-27	THORNE, et al.
10	20180028733	A1	2018-02-01	RIGERT, et al.
11	20180333523	A1	2018-11-22	CHANG, et al.

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Application Number	17181057
Filing Date	2021-02-22
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Art Unit	3783
Examiner Name	
Attorney Docket Number	373499.00049

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
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Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	01/12/2022
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Signature	/Mark D. Simpson/	Date (YYYY-MM-DD)	2021-09-05
Name/Print	Mark D. Simpson	Registration Number	32942

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## PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	17/181057.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:05 PM
L2	128	((("O'TOOLE") near3 ("Jonathan")) OR ("ROLLO") near3 ("Adam")) OR ("CARR") near3 ("Andrew"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/12/31 01:05 PM
L3	8470	a61m1/06-069.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L5	2	("20170216505").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L6	8	("20130023821" "20070219486" "20160296682").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:14 PM
L7	2	("20140378895").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:16 PM
L8	2	("7824363").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU,	OR	ON	ON	2022/01/01 01:04 PM

			SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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### PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

**Bibliographic Data**

Application No: 17/181,057

Foreign Priority claimed: ☒ Yes ☐ No35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged:

/COURTNEY B  
FREDRICKSON/

Examiner's Signature

Initials

Title:

BREAST PUMP SYSTEM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/22/2021	604	3783	ELVI-002/06US
<b>RULE</b>			

**APPLICANTS**

CHIARO TECHNOLOGY LIMITED, London, UNITED KINGDOM

**INVENTORS**

Jonathan O'TOOLE, London, UNITED KINGDOM

Adam ROLLO, London, UNITED KINGDOM

Andrew CARR, London, UNITED KINGDOM

**CONTINUING DATA**

This application is a CON of 16009547 06/15/2018 PAT 10926011

**FOREIGN APPLICATIONS**

UNITED KINGDOM GB1709566.2 06/15/2017

UNITED KINGDOM GB1709561.3 06/15/2017

UNITED KINGDOM GB1709564.7 06/15/2017

UNITED KINGDOM GB1809036.5 06/01/2018

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Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	Courtney B. FREDRICKSON
Attorney Docket Number	ELVI-002/06US 339454-2025

Sheet

1

of

2

**U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	1.	7,666,162 B2	02-23-2010	Renz et al.	
	2.	8,608,685 B2	12-17-2013	Tashiro	
	3.	10,881,766 B2	01-05-2021	O'Toole et al.	
	4.	10,926,011 B2	02-23-2021	O'Toole et al.	
	5.	2004/0087898 A1	05-06-2004	Weniger	
	6.	2009/0281482 A1	11-12-2009	Baker et al.	
	7.	2010/0292636 A1	11-18-2010	Renz et al.	
	8.	2012/0165729 A1	06-28-2012	Cudworth	
	9.	2014/0263611 A1	09-18-2014	Bauer	
	10.	2016/0228625 A1	08-11-2016	Holtz et al.	
	11.	2018/0110900 A1	04-26-2018	Barack	
	12.	2021/0196873 A1	07-01-2021	O'Toole et al.	
	13.	2021/0196876 A1	07-01-2021	O'Toole et al.	
	14.	2021/0196874 A1	07-01-2021	O'Toole et al.	
	15.	2021/0196875 A1	07-01-2021	O'Toole et al.	
	16.	2021/0205511 A1	07-08-2021	O'Toole et al.	
	17.	2021/0205512 A1	07-08-2021	O'Toole et al.	
	18.	2021/0205513 A1	07-08-2021	O'Toole et al.	
	19.	2021/0205514 A1	07-08-2021	O'Toole et al.	
	20.	2021/0205515 A1	07-08-2021	O'Toole et al.	
	21.	2021/0205516 A1	07-08-2021	O'Toole et al.	
	22.	2021/0205517 A1	07-08-2021	O'Toole et al.	
	23.	2021/0205518 A1	07-08-2021	O'Toole et al.	
	24.	2021/0228789 A1	07-29-2021	O'Toole et al.	
	25.	2021/0268158 A1	09-02-2021	O'Toole et al.	

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	Courtney B. FREDRICKSON
Attorney Docket Number	ELVI-002/06US 339454-2025

Sheet

2

of

2

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> "Number <sup>4</sup> "Kind Code <sup>5</sup> (if known)				
	26.	CN 101549180 A	10-07-2009	Pigeon Corp.	Corresponds to US8608685	
	27.	EP 0503280 A2	02-08-1992	Pierburg GmbH		
	28.	GB 2435617 B	03-05-2008	Playtex Products Inc.		
	29.	WO 2005/079441 A2	09-01-2005	Childrens Hospital Medical Center		

**NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
	30.	GB Search Report, dated Nov. 15, 2017, issued in priority GB Application No. GB1709561.3.	
	31.	GB Search Report, dated Nov. 28, 2017, issued in priority GB Application No. GB1709566.2.	
	32.	GB Search Report, dated Nov. 29, 2017, issued in priority GB Application No. GB1709564.7.	
	33.	International Search Report issued in PCT/GB2018/051659 dated December 4, 2018, 9 pages.	

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	01/12/2022
-----------------------	--------------------------	--------------------	------------

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

## TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Title	BREAST PUMP SYSTEM
Art Unit	3783
Examiner Name	Courtney B. FREDRICKSON
Attorney Docket Number	4944.0120006

### SIGNATURE of Applicant or Patent Practitioner

Signature	/Anupma Sahay #78,704/	Date (Optional)	
Name	Anupma Sahay	Registration Number	78,704
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Chiaro Technology Limited		

**NOTE:** This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



\*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

**POWER OF ATTORNEY BY APPLICANT**

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

26111

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

**CHIARO TECHNOLOGY LIMITED**

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

**SIGNATURE of Applicant for Patent**

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature /Hannah Brunskill/ Date (Optional) 8 December 2021

Name Hannah Brunskill

Title Head of Legal

**NOTE:** Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	44977990
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	58249
<b>Filer:</b>	Anupma Sahay/Rolonda Lee
<b>Filer Authorized By:</b>	Anupma Sahay
<b>Attorney Docket Number:</b>	ELVI-002/06US
<b>Receipt Date:</b>	11-FEB-2022
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	17:56:02
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	no
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	2022-02-11-Transmittal-Form-4944-0120006.pdf	1287494 d725f03d80fa6bab0960448fdd84cce8ad30d36e	no	2

**Warnings:**

Information:					
2	Authorization for Extension of Time all replies	2022-02-11-EOT-Authorization-4944-0120006.pdf	97945  5a79c260d0beb35644b7d6278f18c0531f4390aa	no	1
Warnings:					
Information:					
3	Power of Attorney	2022-02-11-POA-82A-4944-0120006.pdf	514012  43965031c9a62c01effe034e091baca721ab214	no	1
Warnings:					
Information:					
4	Power of Attorney	2022-02-11-POA-82B-4944-0120006.pdf	511087  f8a9fa77ddb50636ad50d2b6e5e926a62169a6dd	no	1
Warnings:					
Information:					
Total Files Size (in bytes):			2410538		
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	Courtney B. FREDRICKSON
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s)  <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input checked="" type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Authorization under 37 CFR 1.136(a)(3)
<div>Remarks</div> <p>The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.</p>		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Anupma Sahay #78,704/		
Printed name	Anupma Sahay		
Date	February 11, 2022	Reg. No.	78,704

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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## Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: Chiaro Technology Limited

Art Unit: 3783

Application No.: 17/181,057

Examiner: Courtney B. FREDRICKSON

Filing Date: 02/22/2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Authorization to Treat a Reply as Incorporating an  
Extension of Time Under 37 C.F.R. § 1.136(a)(3)**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

The U.S. Patent and Trademark Office is hereby authorized to treat any concurrent or future reply that requires a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. The U.S. Patent and Trademark Office is hereby authorized to charge all required extension of time fees to our Deposit Account No. 19-0036, if such fees are not otherwise provided for in such reply.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Anupma Sahay #78,704/

Anupma Sahay  
Attorney for Applicant  
Registration No. 78,704

Date: February 11, 2022

1100 New York Avenue, N.W.  
Washington, D.C. 20005-3934  
(202) 371-2600

18011752\_1





## UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
 Address: COMMISSIONER FOR PATENTS  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/181,057	02/22/2021	Jonathan O'TOOLE	ELVI-002/06US

**CONFIRMATION NO. 4690****POWER OF ATTORNEY NOTICE**

0000000131861528

58249  
 COOLEY LLP  
 ATTN: IP Docketing Department  
 1299 Pennsylvania Avenue, NW  
 Suite 700  
 Washington, DC 20004

Date Mailed: 02/17/2022

**NOTICE REGARDING CHANGE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 02/11/2022.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tnguyen/

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## UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
 Address: COMMISSIONER FOR PATENTS  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006

**CONFIRMATION NO. 4690****POA ACCEPTANCE LETTER**

26111  
 STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.  
 1100 NEW YORK AVENUE, N.W.  
 WASHINGTON, DC 20005



CC000000131861557

Date Mailed: 02/17/2022

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 02/11/2022.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tnguyen/

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Applicant: Chiaro Technology Limited

Application No.: 17/181,057

Filed: February 22, 2021

Title: **BREAST PUMP SYSTEM**

Confirmation No.: 4690

Art Unit: 3783

Examiner: FREDRICKSON, Courtney B.

Atty. Docket: 4944.0120006

**Amendment and Reply Under 37 C.F.R. § 1.111**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

In reply to the Office Action dated January 26, 2022, Applicant submits the following amendment and remarks.

If extensions of time are necessary to prevent abandonment of this application, then they are petitioned for under 37 C.F.R. § 1.136(a). Any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Reply to Office Action of  
January 26, 2022

- 2 -

Chiaro Technology Limited  
Application No. 17/181,057

### *Amendments to the Claims*

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently amended) A breast pump device ~~that is configured as a self-contained, in-bra wearable device~~, comprising:  
a self-contained, in-bra wearable device comprising:
  - ~~(i)~~ a housing comprising: that includes
    - (a) a battery, and
    - ~~(b)~~ a pump configured to generate ~~generating~~ negative air pressure;
  - ~~(ii)~~ a breast shield of a plurality of interchangeable breast shields each having a different size and being configured to slide in and out of the housing, the breast shield comprising-made up of a breast flange and a nipple tunnel comprising a side wall and a front end, wherein-in which the breast shield is transparent or optically clear; and
  - ~~(iii)~~ a milk container ~~that is~~ configured to be attached to and removed from the housing,  
wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.
2. (Canceled)
3. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is rigid.
4. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is a dishwasher safe, plastic breast shield.

Reply to Office Action of  
January 26, 2022

- 3 -

Chiaro Technology Limited  
Application No. 17/181,057

5. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to be attached using magnets to the housing.
6. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast.
7. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to present[[s]], in use, a single continuous surface to a nipple and a breast.
8. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield integrates the breast flange and the nipple tunnel are integrally formed ~~as a single item~~.
9. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to be generally symmetrical about a center-line ~~centre-line~~ running from a top to a bottom of the breast shield when positioned upright for normal use.
10. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to slide into the housing with a single push action.
11. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the breast shield is configured to slide out from the housing, together with a membrane that is configured to prevent[[s]] milk from flowing into the pump.
12. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein-in which the milk container is rigid.

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13. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the milk container is an optically clear, dishwasher safe, plastic milk container.
14. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~the in which~~ milk container is configured to attach[[es]] to a lower part of the housing and forms a base of the breast pump device.
15. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the milk container is configured to magnetically attach to the housing.
16. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the nipple tunnel comprises ~~includes~~ guide lines running parallel along one or more sides of the nipple tunnel.
17. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the nipple tunnel comprises ~~includes~~ an air hole or passage, and wherein the pump is configured to transfer[[s]] negative air pressure into the nipple tunnel via the air hole or passage.
18. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the nipple tunnel comprises ~~includes~~ on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container.
19. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the pump comprises ~~includes~~ one or more piezo air pumps.
20. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the housing further comprises ~~includes~~ a Universal Serial Bus (USB) charging socket.
21. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the housing comprises ~~includes~~ a left or right breast selector or toggle switch that, when selected

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for a particular pumping session, is configured to send[[s]] data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast.

22. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the housing is configured to be shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra.
23. (Canceled).
24. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the breast pump device is configured to deliver a maximum suction of approximately 240 \_mmHg.
25. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the breast pump device comprises ~~includes~~ a sensor that is configured to directly measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.
26. (Canceled)
27. (Canceled)
28. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the pump is configured to deliver[[s]] in excess of 400 mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
29. (Currently amended) The breast pump device of claim ~~Claim~~ 1, wherein ~~in which~~ the pump is a lightweight air pump that enables a total mass of the breast pump device, unfilled with milk, to be less than 250 gm.

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30. (Currently amended) The breast pump device of ~~claim~~Claim 1, ~~wherein-in which~~ the breast pump device ~~is configured to make-makes~~ less than 30 dB noise at maximum power and less than 25 dB at normal power, against a 20 dB ambient noise.
31. (Currently amended) A kit, comprising:  
the breast pump device of ~~claim~~Claim 1; and  
the plurality of interchangeable breast shields.
32. (Currently amended) The kit of ~~claim~~Claim 31, wherein each of the plurality of interchangeable breast shields ~~comprises~~includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.
33. (Currently amended) The breast pump device of ~~claim~~Claim 1, wherein the battery is a rechargeable battery, and ~~wherein~~ the housing further ~~comprises~~includes (e)  
a power charging circuit ~~configured to control~~for controlling the charging of the rechargeable battery, and  
~~(d)~~ control electronics ~~configured to be~~ powered by the rechargeable battery.
34. (New) The breast pump device of claim 1, wherein length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same.



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### ***Remarks***

Upon entry of the foregoing amendment, claims 1, 3–22, 24–25, and 28–34 are pending in the application. Claim 1 is an independent claim. Claims 1, 3–22, 24–25, and 28–34 are amended. Claim 2 is canceled without prejudice or disclaimer. New claim 34 is added. These changes do not introduce any new matter, and Applicant respectfully requests their entry.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Office reconsider and withdraw all outstanding objections and rejections.

### ***Allowable Subject Matter***

The Office indicates claim 28 is allowable over the prior art of record excepting the double patenting rejection of the same. (Office Action dated January 26, 2022, p. 53.) Applicant appreciates the Office’s indication that claim 28 would be allowable if the double patenting rejection is overcome. (*Id.*) For at least the reasons discussed below, all pending claims are allowable over the cited art.

### ***Claim Objections***

The Office objects to claims 14, 28, and 29 because of alleged informalities. (*Id.*, 2.) Without acquiescing to the propriety of the objections and in an effort to expedite prosecution, Applicant amends claims 14, 28, and 29 to recite “the milk container,” recite “the pump is configured to deliver,” and to end in a period, respectively. Accordingly, Applicant asks the Office to withdraw the objections to claims 14, 28, and 29.

### ***Rejections under 35 U.S.C. § 103***

The Office rejects claim 1 under 35 U.S.C. § 103 as allegedly obvious over U.S. Publication No. 2008/0275386 to Myers in view of U.S. Publication No. 2014/0378895 to Barack. (*Id.*, 4.) The Office also rejects claim 1 under 35 U.S.C. § 103 as allegedly obvious over U.S. Publication No. 2013/0023821 to Khalil *et al.* in view of Myers and Barack. (*Id.*, 8.)

Without acquiescing to the propriety of the rejection and in an effort to expedite prosecution, Applicant amends claim 1. For at least the reasons discussed below, Khalil, Myers, and Barack,

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alone or in combination, do not disclose or suggest the features of claim 1, and do not render obvious claim 1 or its dependents.

### Independent Claim 1

Claim 1 recites, in part, “wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.” The Office acknowledges that Myers and Khalil do not teach or disclose “the breast shield being of a plurality of interchangeable breast shields each having a different size.” (*Id.*, 5, 9.) Instead, the Office relies on Barack as allegedly teaching “interchangeable breast shields each having a different size.” (*Id.* (citing Barack, ¶[0054]).) However, Barack’s limited disclosure simply states that says that one breast shield with one tunnel size may be switched with another breast shield with another tunnel size. (Barack, ¶[0054].) Barack fails to disclose or suggest how the tunnel sizes are different, let alone that the tunnel sizes provide “a different spacing of a nipple from the side wall of the nipple tunnel,” as claimed.

Accordingly, Khalil, Myers, and Barack, alone or in combination, fail to disclose or suggest “wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast” and do not render claim 1 obvious. Applicant asks the Office to withdraw the § 103 rejections of claim 1.

### Dependent Claims

The Office rejects claims 2–3, 6–8, 10, 11, 14, 16–18, 22, 24, and 31 under 35 U.S.C. § 103 as allegedly obvious over Myers in view of Barack. (Office Action dated January 26, 2022, p. 4.) Claim 2 is canceled rendering its rejection moot. Claims 3, 6–8, 10–11, 14, 16–18, 22, 24, and 31 depend from and add features to claim 1. Accordingly, claims 3, 6–8, 10–11, 14, 16–18, 22, 24, and 31 are allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claims 3, 6–8, 10–11, 14, 16–18, 22, 24, and 31.

The Office rejects claim 4 under 35 U.S.C. § 103 as allegedly obvious over Myers in view of Barack, as applied to claim 1 above, and further in view of U.S. Publication No. 2016/0296682 to

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Phillips *et al.*, as evidenced by U.S. Publication No. 2005/0228342 to Yuen. (*Id.*, 7.) Claim 4 depends from and adds features to independent claim 1. Phillips and Yuen do not overcome the deficiencies discussed above. Accordingly, claim 4 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 4.

The Office rejects claims 2, 6–10, 14, 17, 18, 20–22, and 31 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and Barack. (*Id.*, 8.) Claim 2 is canceled rendering its rejection moot. Claims 6–10, 14, 17, 18, 20–22, and 31 depend from and add features to claim 1. Accordingly, claims 6–10, 14, 17, 18, 20–22, and 31 are allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claims 6–10, 14, 17, 18, 20–22, and 31.

The Office rejects claim 5 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of U.S. Publication No. 2018/0333523 to Chang. (*Id.*, 13.) Claim 5 depends from and adds features to independent claim 1. Chang does not overcome the deficiencies discussed above. Accordingly, claim 5 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 5.

The Office rejects claims 12 and 13 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of Phillips. (*Id.*, 13.) Claims 12–13 depend from and add features to independent claim 1. Phillips does not overcome the deficiencies discussed above. Accordingly, claims 12–13 are allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claims 12–13.

The Office rejects claim 15 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of U.S. Publication No. 2007/0228059 to Karsan. (*Id.*, 15.) Claim 15 depends from and adds features to independent claim 1. Karsan does not overcome the deficiencies discussed above. Accordingly, claim 15 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 15.

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The Office rejects claim 19 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of U.S. Publication No. 2012/0277636 to Blondheim *et al.* (*Id.*, 16.) Claim 19 depends from and adds features to independent claim 1. Blondheim does not overcome the deficiencies discussed above. Accordingly, claim 19 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 19.

The Office rejects claim 25 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of U.S. Publication No. 2016/0220743 to Guthrie *et al.* (*Id.*) Claim 25 depends from and adds features to independent claim 1. Guthrie does not overcome the deficiencies discussed above. Accordingly, claim 25 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 25.

The Office rejects claim 29 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, and further in view of U.S. Patent No. 6,227,936 to Mendoza. (*Id.*, 17.) Claim 29 depends from and adds features to independent claim 1. Mendoza does not overcome the deficiencies discussed above. Accordingly, claim 29 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 29.

The Office rejects claim 30 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, in further view of U.S. Publication No. 2009/0281485 to Baker *et al.* (*Id.*, 18.) Claim 30 depends from and adds features to independent claim 1. Baker does not overcome the deficiencies discussed above. Accordingly, claim 30 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 30.

The Office rejects claim 32 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 31 above, in further view of U.S. Publication No. 2012/0165729 to Cudworth. (*Id.*, 18.) Claim 32 depends from and adds features to independent claim 1. Cudworth does not overcome the deficiencies discussed above. Accordingly, claim 32 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 32.

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The Office rejects claim 33 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers and in further view of Barack, as applied to claim 1 above, in further view of U.S. Patent No. 5,542,921 to Meyers *et al.* (*Id.*, 19.) Claim 33 depends from and adds features to independent claim 1. Meyers does not overcome the deficiencies discussed above. Accordingly, claim 33 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 33.

### ***Double Patenting Rejections***

The Office rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of U.S. Patent No. 10,881,766 in view of Khalil, Myers, and Barack. (*Id.*, 21.) The Office rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of U.S. Patent No. 10,926,011 in view of Khalil, Myers, and Barack. (*Id.*, 23.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,050. (*Id.*, 26.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,079. (*Id.*, 29.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,109. (*Id.*, 30.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,150. (*Id.*, 32.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,179. (*Id.*, 34.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,216. (*Id.*, 36.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,259. (*Id.*, 38.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground of nonstatutory double patenting as allegedly obvious over claims 1 and 31 of copending U.S. Application No. 17/203,292. (*Id.*, 39.) The Office provisionally rejects claims 1–22, 24, 25, and 28–33 on the ground

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of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,313. (*Id.*, 41.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,327. (*Id.*, 43.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,355. (*Id.*, 45.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,384. (*Id.*, 47.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,397. (*Id.*, 49.) The Office provisionally rejects claims 1–22, 24, 25, and 29–33 on the ground of nonstatutory double patenting as allegedly obvious over claim 1 of copending U.S. Application No. 17/203,418. (*Id.*, 51.)

Application Nos. 17/203,109, 17/203,259, and 17/203,313 issued rendering the rejections with respect to these applications moot. Additionally, Applicant respectfully requests that the remaining currently asserted double patenting rejections be held in abeyance until the claimed subject matter is otherwise deemed allowable. After analyzing the final allowed claim scope, Applicant will consider filing a terminal disclaimer if necessary to overcome any obviousness-type double patenting rejections.

### ***New Claim***

New claim 34 is added. Claim 34 depends from and adds features to independent claim 1. Accordingly, claim 34 is allowable for at least the same reasons as claim 1.

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***Conclusion***

All grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Office reconsider and withdraw them. A complete reply has been made to the outstanding Office Action. As such, the present application is in condition for allowance. If the Office believes, for any reason, that personal communication will expedite prosecution of this application, the Office is asked to telephone the undersigned at the number provided. Applicant respectfully requests prompt and favorable consideration of this amendment and reply.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Anupma Sahay #78,704/

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Date: July 12, 2022

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18100718.1

Atty. Dkt. No. 4944.0120006

<b>Application Data Sheet</b> <b>37 CFR 1.76</b>		Attorney Docket Number	4944.0120006
		Application Number	17/181,057
Title of Invention	BREAST PUMP SYSTEM		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

**Inventor Information:**

<b>Inventor 1 Legal Name</b>				
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<b>Residence Information (Select One):</b>				
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<b>Inventor 3 Legal Name</b>				
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	Andrew		CARR	
<b>Residence Information (Select One):</b>				
<input type="checkbox"/> US Residency <input checked="" type="checkbox"/> Non US Residency <input type="checkbox"/> Active US Military Service				
<b>City</b>	<del>London</del> Edinburgh	<b>State/Province</b>		<b>Country of Residence</b> GB
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<b>Application Data Sheet</b> <b>37 CFR 1.76</b>	Attorney Docket Number	4944.0120006
	Application Number	17/181,057
Title of Invention	BREAST PUMP SYSTEM	

City	London	State/Province	
Postal Code	EC1N 8LE	Country	GB

**Signature:**

**NOTE:** This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application **and** either box A or B is **not** checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Anupma Sahay #78,704/			Date (YYYY-MM-DD)	2022-07-12
First Name	Anupma	Last Name	Sahay	Registration Number	78,704

18467276.1

Substitute for form 1449/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	17/181,057
Filing Date	02-22-2021
First Named Inventor	O'TOOLE; Jonathan
Art Unit	3783
Examiner Name	COURTNEY B. FREDRICKSON
Attorney Docket Number	4944.0120006

Sheet 1 of 4

**U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	001	US-D788293-S	05-30-2017	ECKSTEIN et al.	
	002	US-D809646-S	02-06-2018	MASON et al.	
	003	US-D832995-S	11-06-2018	MASON et al.	
	004	US-D888225-S	06-23-2020	ASKEM et al.	
	005	US-7641629-B2	01-05-2010	YUEN; Yat Keung William	
	006	US-10398816-B2	09-03-2019	CHANG et al.	
	007	US-10625005-B2	04-21-2020	CHANG et al.	
	008	US-20040127845-A1	07-01-2004	RENZ; Charles J. et al.	
	009	US-20070219486-A1	09-20-2007	MYERS; Kenneth E. et al.	
	010	US-20120021068-A1	01-26-2012	BARNESS; Itzhak et al.	
	011	US-20120035951-A1	02-09-2012	GOETZ; Steven M. et al.	
	012	US-20120043065-A1	02-23-2012	RANNE; Pasi et al.	
	013	US-20120072117-A1	03-22-2012	LODDOCH; Alexander et al.	
	014	US-20120072118-A1	03-22-2012	MANN; Tobias	
	015	US-20120095599-A1	04-19-2012	PAK; H. Ali et al.	
	016	US-20120143879-A1	06-07-2012	STOITSEV; Todor	
	017	US-20120220753-A1	08-30-2012	GERA; Lajos et al.	
	018	US-20150212036-A1	07-30-2015	JIN; Jian et al.	
	019	US-20150212037-A1	07-30-2015	OKAZAKI; Satoshi et al.	
	020	US-20170216505-A1	08-03-2017	KIM; Sang Ha	
	021	US-20180361040-A1	12-20-2018	O'TOOLE; Jonathan et al.	
	022	US-20210030934-A1	02-04-2021	ZHANG; Shu Ting	

Examiner  
SignatureDate  
Considered

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B. FREDRICKSON
Sheet	2	of	4	Attorney Docket Number	4944.0120006

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known)				
	001	WO-2016010524-A1	01-21-2016	HEWLETT PACKARD DEVELOPMENT CO [US]		<input type="checkbox"/>

Examiner Signature		Date Considered	
-----------------------	--	--------------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B. FREDRICKSON
Sheet	3	of	4	Attorney Docket Number	4944.0120006

NON-PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T <sup>2</sup>	
	001	4MD Medical, "Assembling Spetra Breast Pump Parts," YouTube [online], dated November13, 2016, URL: <a href="http://www.youtube.com/watch?v=ChV8xQfcBxU">http://www.youtube.com/watch?v=ChV8xQfcBxU</a> .	<input type="checkbox"/>	
	002	The Best Hands-Free Breast Pumps, posted at healthline.com, earliest date posted on 08/24/2020, [online], acquired on 10/30/2021, Available on internet. url: <a href="https://www.healthline.com/health/parenting/breast-feeding/best-hands-free-breast-pumps#Best-hands-free-breast-pumps">https://www.healthline.com/health/parenting/breast-feeding/best-hands-free-breast-pumps#Best-hands-free-breast-pumps</a> (Year: 2020).	<input type="checkbox"/>	

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	17/181,057
Filing Date	02-22-2021
First Named Inventor	O'TOOLE; Jonathan
Art Unit	3783
Examiner Name	COURTNEY B. FREDRICKSON
Attorney Docket Number	4944.0120006

Sheet	4	of	4
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Anupma Sahay #78,704/	Date (YYYY-MM-DD)	2022-07-12
Name/Print	Anupma Sahay	Registration Number	78,704

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/046715**A. CLASSIFICATION OF SUBJECT MATTER****G06F 3/02(2006.01)i, G06F 3/048(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
G06F 3/02; G06F 3/048; H04M 1/24; G06F 3/041; G09G 5/00Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean utility models and applications for utility models  
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & keywords: virtual keyboard, sensor, detect, hand, user, profile, and similar terms.**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012-0260207 A1 (ANTON TRESKUNOV et al.) 11 October 2012 See paragraphs 7, 27-52; claims 4, 16, 29; and figures 1-6B.	1-6, 9-13
Y		7-8, 14-15
Y	US 2013-0109369 A1 (BABAK FORUTANPOUR et al.) 02 May 2013 See paragraphs 73-74; and figure 7.	7-8, 14-15
A	US 2013-0127729 A1 (TIMOTHY J. MOSBY et al.) 23 May 2013 See paragraphs 27-43; and figures 1-4.	1-15
A	US 2009-0303200 A1 (JOEL GRAD) 10 December 2009 See paragraphs 47-63; and figures 2-7.	1-15
A	US 2005-0225538 A1 (WILHELMUS VERHAEGH) 13 October 2005 See paragraphs 18-32; and figures 1-4.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
25 February 2015 (25.02.2015)Date of mailing of the international search report  
**25 February 2015 (25.02.2015)**Name and mailing address of the ISA/KR  
International Application Division  
Korean Intellectual Property Office  
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701,  
Republic of Korea

Facsimile No. ++82 42 472 3473

Authorized officer

BYUN, Sung Cheal

Telephone No. +82-42-481-8262



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2014/046715**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012-0260207 A1	11/10/2012	KR 10-2012-0114139 A	16/10/2012
US 2013-0109369 A1	02/05/2013	CN 103931163 A	16/07/2014
		EP 2772044 A1	03/09/2014
		JP 2014-532915 A	08/12/2014
		US 2014-235225 A1	21/08/2014
		US 8750852 B2	10/06/2014
		WO 2013-062771 A1	02/05/2013
US 2013-0127729 A1	23/05/2013	US 2009-237361 A1	24/09/2009
		US 8358277 B2	22/01/2013
		US 8619036 B2	31/12/2013
US 2009-0303200 A1	10/12/2009	CN 101634932 A	27/01/2010
		EP 2133778 A2	16/12/2009
		EP 2133778 A3	27/01/2010
		GB 0810613 D0	16/07/2008
		GB 2462579 A	17/02/2010
		US 8619034 B2	31/12/2013
US 2005-0225538 A1	13/10/2005	AT 538430 T	15/01/2012
		AU 2004-244973 A1	23/01/2004
		AU 2004-244973 A8	23/01/2004
		CN 00280700 C	18/10/2006
		CN 100666170 A	07/09/2005
		EP 1522007 A2	13/04/2005
		EP 1522007 B1	21/12/2011
		JP 04828826 B2	30/11/2011
		JP 2005-531861 A	20/10/2005
		US 8576173 B2	05/11/2013
		WO 2004-006080 A2	15/01/2004
		WO 2004-006080 A3	02/09/2004

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	17181057			
<b>Filing Date:</b>	22-Feb-2021			
<b>Title of Invention:</b>	BREAST PUMP SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE			
<b>Filer:</b>	Anupma Sahay/Tierra Brown			
<b>Attorney Docket Number:</b>	4944.0120006			
Filed as Small Entity				
<b>Filing Fees for Utility under 35 USC 111(a)</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				



Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 3 months with \$0 paid	2253	1	740	740
<b>Miscellaneous:</b>				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	130	130
<b>Total in USD (\$)</b>				<b>870</b>

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	46171157
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	26111
<b>Filer:</b>	Anupma Sahay/Tierra Brown
<b>Filer Authorized By:</b>	Anupma Sahay
<b>Attorney Docket Number:</b>	4944.0120006
<b>Receipt Date:</b>	12-JUL-2022
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	16:33:06
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 870
RAM confirmation Number	E20227BG33514836
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	2022-07-12-Transmittal-Form-4944-0120006.PDF	220103	no	1
			d3d040249e346affb1793345a77a30bbcc757178		

**Warnings:****Information:**

2	Extension of Time	2022-07-12-EOT-4944-0120006.PDF	167612	no	1
			bf684690e0a81d6bdb7e27c6a30d0c71b470cdb1		

**Warnings:****Information:**

3		2022-07-12-Amendment-Reply-111-4944-0120006.PDF	150019	yes	13
			10890028d3f5c8bb27aefdf6e44e814bfd2d215b		

**Multipart Description/PDF files in .zip description**

Document Description		Start	End
Amendment/Request for Reconsideration-After Non-Final Rejection		1	1
Claims		2	6
Applicant Arguments/Remarks Made in an Amendment		7	13

**Warnings:****Information:**

4	Application Data Sheet	2022-07-12-Marked-Up-ADS-4944-0120006.PDF	110254	no	2
			cea4233788a433b504fbb0d08aefa20091e71e79		

**Warnings:****Information:**

This is not an USPTO supplied ADS fillable form

Case 2:23-cv-00631-KKE Document 136-9 Filed 12/11/24 Page 630 of 1121

5	Information Disclosure Statement (IDS) Form (SB08)	2022-07-12-IDS-Form-SB08a-4944-0120006.PDF	121895	no	4
			f932f16bcfad204fa3c9892721473715d3df5027		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
6	Non Patent Literature	NPL1_4MD-Medical-4944-0120006.PDF	435766	no	3
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Warnings:					
Information:					
7	Non Patent Literature	NPL2_Best-Hands-Free-Breast-Pumps-4944-0120006.PDF	858447	no	11
			1f513f3e5a82aeacd71f1eee85427355bb3d864c		
Warnings:					
Information:					
8	Foreign Reference	FP1_WO2016010524A1-4944-0120006.PDF	2679431	no	34
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Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	40606	no	2
			02fc0ff0b27370e65a3d7a9aedb2a90547d59de8		
Warnings:					
Information:					
Total Files Size (in bytes):			4784133		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDRICKSON, Courtney B.
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)				
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input checked="" type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Marked-Up Application Data Sheet; FP1; NPL1-NPL2		
<table border="1"><tr><td>Remarks</td></tr><tr><td>Online Credit Card Authorization for \$870.00 to cover:  \$130.00 - Information Disclosure Statement Fee; \$740.00 - 3 Month Extension of Time Fee  The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.</td></tr></table>			Remarks	Online Credit Card Authorization for \$870.00 to cover:  \$130.00 - Information Disclosure Statement Fee; \$740.00 - 3 Month Extension of Time Fee  The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.
Remarks				
Online Credit Card Authorization for \$870.00 to cover:  \$130.00 - Information Disclosure Statement Fee; \$740.00 - 3 Month Extension of Time Fee  The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.				
<b>SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT</b>				
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.			
Signature	/Anupma Sahay #78,704/			
Printed name	Anupma Sahay			
Date	July 12, 2022	Reg. No. 78,704		

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid control number.		Docket Number (Optional)
PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		4944.0120006
Application Number	17/181,057	Filed February 22, 2021
For	BREAST PUMP SYSTEM	
Art Unit	3783	Examiner FREDRICKSON, Courtney B.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	of	2	Attorney Docket Number	4944.0120006

**U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	US1	2014/0288466 A1	09-25-2014	Alvarez et al.	
	US2	2017/0173233 A1	06-22-2017	Tanaka	
	US3	2017/0292509 A1	10-12-2017	Kurihara et al.	

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
	FP1	JP 2007501673 A	02-01-2007	PLAYTEX PRODUCTS INC		X
	FP2	JP 2014529312 A	11-06-2014	MEDELA HOLDING AG		X
	FP3	JP 2016514516 A	05-23-2016	NAIA HEALTH INC		X
	FP4	JP 2017509379 A	04-06-2017	NAIA HEALTH INC		X

Examiner Signature	Date Considered	
--------------------	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
				Attorney Docket Number	4944.0120006
Sheet	2	of	2		

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.

- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

- ☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Anupma Sahay #78,704/	Date (YYYY-MM-DD)	2022-09-16
Name/Print	Anupma Sahay	Registration Number	78,704

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## 【国際調査報告】

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US15/14901

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - A01J 5/00, 5/007; A61M 1/06 (2015.01) CPC - A01J 5/047; A61M 1/06 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8): A01J 5/00, 5/007; A61M 1/06 (2015.01) CPC: A01J 5/047; A61M 1/06; USPC: 119/14.02; 604/74, 346 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); Google; Google Scholar; Google Patent; ProQuest; Medline/PubMed. Search terms: Breast*, Milk*, Mammar* W5 Pump*, Express*, Vacuum*, Draw*, Computer*, Processor*, CPU, Microprocess*, Data*, Internet*, Server*, Informat*, Network*, Wireless*, Near, Field, USB, Connect*, Communicat*, Transfer*, SMS		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6547756 B1 (GRETER, A, et al.) April 15, 2003; abstract; figure 1; column 2, lines 24-37; column 5, lines 46-57; column 7, lines 53-56; column 8, lines 8-11; column 9, lines 38-55; claims 8, 20, 25, 28-31	1, 3-8, 14, 15, 19, 22-24, 28, 30-33, 38, 39, 45, 48, 49
-		
Y		2, 9-13, 16-18, 20, 21, 25, 26, 29, 34-37, 40-44, 46, 47, 50
Y	US 2010/0121266 A1 (BRYAN, RG et al.) May 13, 2010; figure 2; paragraph [0070]	2, 29
Y	US 2007/0209595 A1 (UMEGARD, A, et al.) September, 13, 2007; paragraphs [0016], [0023]-[0024]; claim 10	9-13, 25, 26, 34-37, 46, 47, 50
Y	WO 00/41744 A1 (TAGGART MEDO) July 20, 2000; page 2, lines 10-21; page 11, lines 28-31; page 12, lines 1-2; claims 1, 7	16, 17, 20, 43
Y	WO 2013/070063 A1 (LELY PATENT N.V.) May 16, 2013; page 6, fourth paragraph	18, 44
Y	US 2013/0125821 A1 (GIBBS, RN et al.) May 23, 2013; paragraphs [0053], [0054]	20, 21, 40-42
A	US 2010/0284251 A1 (CHANG, S) November 11, 2010; abstract; paragraph [0004]	1-26, 28-50
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 30 April 2015 (30.04.2015)		Date of mailing of the international search report 08 JUL 2015
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US15/14901

**Box No. II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

Group I: Claims 1-26 and 28-50 are directed toward a method, system and apparatus for measuring milk expression from a breast.

Group II: Claims 27 and 51 are directed toward a method for controlling and remotely controlling expression of milk from a breast comprising receiving a control signal from a server via a network.

Group III: Claims 52-91 are directed toward an apparatus and method for measuring the volume of fluid expressed from a breast, comprising: a sensing unit configured to generate measurement data indicative of volume of expressed fluid from the breast.

\*\*\*Continued Within the Extra Sheet\*\*\*

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-26, 28-50

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
PCT/US15/14901

\*\*\*Continuation of Box No. III - Observations where unity of invention is lacking:\*\*\*

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I include transmitting the measurement data from the sensing unit to a computing device via a data connection, which are not present in Groups II-III; the special technical features of Group II include receiving a control signal from a computing device via a data connection, which are not present in Groups I and III; the special technical features of Group III include generating, via the sensing unit, measurement data indicative of volume of the expressed fluid, which are not present in Groups I-II.

The common technical features of Groups I, II and III are an apparatus, system and method relating to expression of fluid/milk from a breast, comprising: providing a breast fluid expression apparatus comprising an interface, an actuation assembly operably coupled to the interface, and a sensing unit; engaging the interface with a breast; actuating the actuation assembly, thereby causing the interface to apply vacuum pressure against the breast; expressing fluid from the breast.

These common technical features are disclosed by US 6,547,756 B1 to Greter et al. (hereinafter "Greter"). Greter discloses an apparatus, system and method relating to expression of fluid/milk from a breast (breastpump which can be programmed to generate a plurality of differing milk expression sequences; abstract), comprising: providing a breast fluid expression apparatus comprising an interface (breastpump with breastshield; claim 1), an actuation assembly operably coupled to the interface (programmable controller having an interface for the inputting of programs; figures 9-10; claim 1), and a sensing unit (sensing mechanism 76 uses a toothed wheel 78a mounted to the shaft 25 of motor 28, which is registered by counter 78b; signals generated by the counter 78b are processed by the cpu of the breastpump; column 7, lines 1-4); engaging the interface with a breast (a breastshield having a portion within which a woman's breast is received for the expression of milk; claim 1); actuating the actuation assembly, thereby causing the interface to apply vacuum pressure against the breast (a source of vacuum in communication with said breastshield; claim 11); expressing fluid from the breast (claim 1).

Since the common technical features are previously disclosed by the Greter reference, the common features are not special and so Groups I, II and III lack unity.

## フロントページの続き

(81) 指定国 AP (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), EA (AM, AZ, BY, KG, KZ, RU, TJ, TM), EP (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OA (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG), AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US

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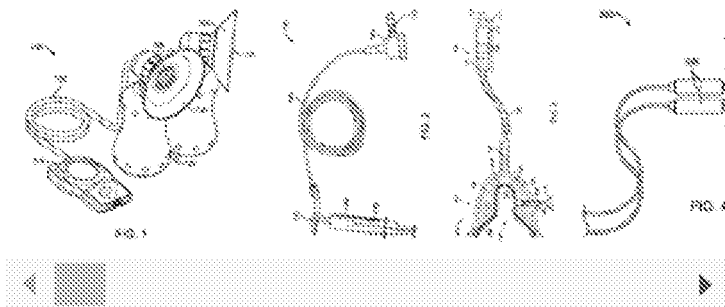
# Method, apparatus and system for milking human breast milk

## Abstract

translated from Japanese

Systems, methods, and devices for milking milk are provided. In one aspect, the system includes a milking device having an interface configured to engage the breast and an actuation assembly operably coupled to the interface. Actuation of the actuating assembly causes the interface to apply reduced pressure to the breast and milk the breast from the breast. The system also includes a computing device configured to communicate with the milking device via a data connection.

## Images (43)



## Classifications

■ A61M1/06 Milking pumps

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JP2017509379A

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**Inventor:** ジェフリー ビー, アルバレス, , ジェフリー ビー, アルバレス, , ジャンカ ビー, アルバレス, , ジャンカ ビー, アルバレス, , アレックス ゴールデンパーク, , アレックス ゴールデンパーク, , グレグ スターラー, , グレグ スターラー, ,

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**Info:** Patent citations (12), Cited by (14), Similar documents, Priority and Related Applications

**External links:** Espacenet, Global Dossier, Discuss

## Claims (91)

Hide Dependent ^  
translated from Japanese

A system for milking breast milk from the breast,

A milking device comprising an interface configured to engage a breast and an actuation assembly operably coupled to the interface, the actuation of the actuation assembly applying a reduced pressure to the interface A milking device for applying to and milking the milk from there,

A computing device configured to communicate with the milking device via a data connection;

A system comprising: The system of claim 1, wherein the interface is configured to fluidly seal against the breast. The data connection utilizes one or more of wireless communication, near field communication, and USB cable to transmit data between at least a portion of the milking device and the computing device; The system of claim 1. The system of claim 1, wherein the computing device is selected from a smartphone, a tablet, and a personal computer. The system of claim 1, wherein the milking device further comprises a sensing unit configured to generate measurement data indicative of one or more characteristics of breast milking. The system of claim 5, wherein the measurement data is transmitted to the computing device via the data connection. The system of claim 6, wherein the computing device comprises an application configured to analyze the measurement data. The system of claim 6, wherein the computing device transmits the measurement data to a server. The system of claim 5, wherein the milking device further comprises a processing unit configured to analyze the measurement data and thereby generate an analysis result. The system of claim 9, wherein the milking device further comprises a display unit configured to display the analysis results to a user. The system according to claim 10, wherein the analysis result is displayed in a graph, a chart, or a table. The system of claim 9, wherein the analysis result is transmitted to the computing device via the data connection. The system of claim 12, wherein the computing device displays the analysis results to a user.

The system of claim 1, wherein the computing device controls at least one functionality of the milking device via the data connection. 15. The functionality of claim 14, wherein the functionality includes one or more of: a power of the milking device, a reduced pressure applied by the milking device, and a cycle per minute of the milking device. system. The system of claim 1, wherein a notification to remind a user to milk breast milk is transmitted to the computing device via the data connection. The system of claim 1, wherein a notification to remind a user to milk breast milk is transmitted to at least a portion of the milking device via the data connection. The system of claim 1, wherein firmware updates are transmitted to at least a portion of the milking device via the data connection. The system of claim 1, wherein the computing device comprises a communication module that communicates with a server over a network. The system of claim 19, wherein a notification to remind a user to milk breast milk is transmitted from the server to the computing device. 21. The computing device of claim 20, wherein the computing device comprises a mobile phone associated with a mobile phone number, and the notification is transmitted to the mobile phone number over the network by a short message service (SMS). system. A method for measuring milking of breast milk from a breast, Providing a breast milking device comprising an interface, an actuation assembly operably coupled to the interface, and a sensing unit; Engaging the breast with the interface; Activating the actuation assembly, thereby causing the interface to apply a reduced pressure to the breast; Milking breast milk from the breast;



Using said sensing unit to measure milking characteristics of breast milk, thereby generating measurement data;  
Transmitting the measurement data from the sensing unit to a computing device via a data connection;  
Including the method. 23. The method of claim 22, further comprising storing the measurement data in one or more data stores of the computing device. 23. The method of claim 22, further comprising analyzing the measurement data via the computing device application and generating an analysis result. 25. The method of claim 24, further comprising displaying the analysis results to a user via the computing device. 26. The method of claim 25, wherein the analysis results are displayed in a graph, chart or table. A method for controlling milking of breast milk from a breast,

Providing a breast milking device comprising an interface and an actuation assembly operably coupled to the interface;

Engaging the breast with the interface;

Receiving a control signal from a computing device via a data connection;

Activating the actuation assembly based on the control signal, thereby causing the interface to apply a reduced pressure to the breast;

Milking breast milk from the breast;

Including the method. A device for milking breast milk from the breast,

An interface configured to engage the breast;

An actuating assembly operably coupled to the interface, wherein actuating the actuating assembly causes the interface to apply a reduced pressure to the breast and milk milk therefrom;

A communication module for communicating with a server via a network;

An apparatus comprising: 30. The apparatus of claim 28, wherein the interface is configured to fluidly seal against the breast. 30. The apparatus of claim 28, wherein the network comprises an internet network. 30. The apparatus of claim 28, further comprising a sensing unit configured to generate measurement data indicative of one or more characteristics of breast milking. 32. The apparatus of claim 31, wherein the measurement data is transmitted to the server via the network. 35. The apparatus of claim 32, wherein the server comprises an application configured to analyze the measurement data. 32. The apparatus of claim 31, further comprising a processing unit configured to analyze the measurement data and thereby generate an analysis result. 35. The apparatus of claim 34, further comprising a display unit configured to display the analysis results to a user. The apparatus according to claim 34, wherein the analysis result is transmitted to the server via the network. 37. The apparatus of claim 36, wherein the analysis result is displayed on a computing device that communicates with the server. 30. The apparatus of claim 28, wherein at least one functionality of the actuation assembly is controlled by an application on the server via the network. 39. The functionality of claim 38, wherein the functionality includes one or more of: power of the actuation assembly, reduced pressure applied by the actuation assembly, and cycles per minute of the actuation assembly. apparatus. 30. The apparatus of claim 28, wherein a notification to remind a user to milk breast milk is transmitted to an email address via the network. 30. The apparatus of claim 28, wherein a notification to remind a user to milk breast milk is transmitted to the mobile phone number via the network by a short message service (SMS). 42. The apparatus of claim 41, wherein the notification is transmitted by SMS from the server to a smartphone associated with the mobile phone number. 29. The apparatus of claim 28, wherein a notification to remind a user to milk breast milk is transmitted to the communication module via the network. 30. The apparatus of claim 28, wherein firmware updates are transmitted to the communication module over the network. A method for measuring milking of breast milk from a breast,

Providing a breast milking device comprising an interface, an actuation assembly operably coupled to the interface, and a sensing unit;

Engaging the breast with the interface;

Activating the actuation assembly, thereby causing the interface to apply a reduced pressure to the breast;

Milking breast milk from the breast;

Using said sensing unit to measure milking characteristics of breast milk, thereby generating measurement data;

Transmitting the measurement data to a server via a network;



Including the method. 46. The method of claim 45, wherein the server is a distributed computing server. 46. The method of claim 45, wherein the milking characteristics of the breast milk are measured by the sensing unit as the breast milk moves from the interface to a collection reservoir in fluid communication with the interface.

46. The method of claim 45, further comprising storing the measurement data in one or more data stores associated with the server. 46. The method of claim 45, further comprising analyzing the measurement data via an application on the server and generating an analysis result. Transmitting the analysis result from the server to a computing device;

Displaying the analysis results to a user via the computing device;

50. The method of claim 49, further comprising: A method for remotely controlling milking of breast milk from a breast,

Providing a breast milking device comprising an interface and an actuation assembly operably coupled to the interface;

Engaging the breast with the interface;

Receiving a control signal from a server via a network;

Activating the actuation assembly based on the control signal, thereby causing the interface to apply a reduced pressure to the breast;

Milking breast milk from the breast;

Including the method. A device for measuring the milking of fluid from the breast,

An interface configured to engage the breast;

An actuating assembly operatively coupled to the interface, wherein actuating the actuating assembly causes the interface to apply a reduced pressure to the breast and milk fluid therefrom;

A sensing unit configured to generate measurement data indicative of the volume of fluid pumped from the breast;

An apparatus comprising: 53. The apparatus of claim 52, wherein the interface is configured to fluidly seal against the breast. 53. The apparatus of claim 52, wherein the fluid is one or more of breast milk and colostrum. 53. The apparatus of claim 52, wherein the measurement data indicates a volume per unit of time of the milked fluid. 53. The apparatus of claim 52, wherein the actuation assembly comprises a pump and the measurement data indicates a volume per stroke of the pumped fluid. 53. The apparatus of claim 52, wherein the actuation assembly comprises a pump and the measurement data indicates the volume per pump power cycle of the milked fluid. 53. The apparatus of claim 52, wherein the interface comprises a valve that allows passage of the milked fluid and the sensing unit comprises an accelerometer that measures movement of the valve. 59. The apparatus of claim 58, wherein the measurement data is generated based on movement of the valve. A second interface configured to engage a second breast, wherein actuation of the actuation assembly causes reduced pressure to be applied alternately to the breast and the second breast; Alternately milking the fluid, the second interface comprises a second valve that allows the passage of fluid pumped from the second breast, and the sensing unit controls the movement of the second valve. 59. The apparatus of claim 58, comprising a second accelerometer to measure. 61. The apparatus of claim 60, wherein the sensing unit determines user movement based on movement detected by both the accelerometer and the second accelerometer. The user movement is subtracted from movement detected by at least one of the accelerometer or the second accelerometer when determining movement of at least one of the first valve or second valve. 62. The apparatus of claim 61, wherein: The interface includes a valve that allows passage of the milked fluid, and the sensing unit includes a first accelerometer coupled to the interface and a second accelerometer coupled to the valve. 54. The apparatus of claim 52, comprising. 64. The apparatus of claim 63, wherein the first accelerometer is configured to measure movement of the interface. 64. The apparatus of claim 63, wherein the second accelerometer is configured to measure movement of the valve. 64. The apparatus of claim 63, wherein the measurement data is generated based on movement of the interface and movement of the valve. 64. The apparatus of claim 63, wherein the sensing unit determines background motion based on motion detected by the first accelerometer. 68. The apparatus of claim 67, wherein the background motion is subtracted from motion detected by the second accelerometer when determining motion of the valve.

The interface is coupled to a reservoir configured to collect the milked fluid, the sensing unit is coupled to the reservoir, the reservoir comprising a processing unit in communication with the sensing unit; 53. The apparatus of claim 52, wherein the unit is configured to receive measurement data generated by the sensing unit. 70. The apparatus of claim 69, wherein the processing unit comprises a communication module configured to transmit the measurement data to a computing device via a data connection. 70. The apparatus of claim 69, wherein the processing unit comprises a communication module configured to transmit the measurement data to a server over a network. 53. The apparatus of claim 52, wherein the sensing unit comprises a beam block sensor configured to detect the passage of the milked fluid in the vicinity of one or more sensor components of the beam block sensor. 73. The apparatus of claim 72, wherein the measurement data is generated based on a length of time that the milked fluid passes between the sensor components. The interface includes a valve that allows passage of the milked fluid, and the sensing unit is configured to count droplets of the milked fluid that pass through the valve. 53. The apparatus of claim 52, comprising a CCD). 75. The apparatus of claim 74, wherein the measurement data is generated based on one or more CCD images of the droplet. The interface comprises a tube that allows passage of the milked fluid, and the sensing unit comprises a capacitive sensor configured to sense the milked fluid contained within the tube. 52. The apparatus according to 52. The interface is coupled to a reservoir configured to collect the milked fluid, and the sensing unit is configured to measure a volume of the milked fluid contained within the reservoir 54. The apparatus of claim 52, comprising a sensor. 53. The apparatus of claim 52, wherein the sensing unit comprises a strain gauge configured to measure a volume of the milked fluid. 80. The interface of claim 78, wherein the interface comprises a valve that allows passage of the milked fluid, and the strain gauge is coupled to the valve and configured to determine displacement of the valve over time. Equipment. The interface is coupled to a reservoir configured to collect the milked fluid, and the strain gauge is coupled to the reservoir to measure the volume of the milked fluid contained within the reservoir. 80. The apparatus of claim 78, wherein the apparatus is configured as follows. The reservoir includes a bottom inner surface having a bellows element, the bellows element configured to minimize absorption by the bottom inner surface of a load applied on the bottom inner surface by the milked fluid. The apparatus of claim 80. 53. The apparatus of claim 52, wherein the sensing unit comprises a camera coupled to the interface and configured to capture one or more images of the milked fluid. 84. The apparatus of claim 82, further comprising a processing unit configured to analyze the one or more images and determine a volume of the milked fluid. 83. The one or more images are transmitted to a computing device configured to analyze the one or more images and determine a volume of the milked fluid. Equipment. The apparatus of claim 84, wherein the computing device is a smartphone. The apparatus of claim 82, wherein the camera is mounted on a mobile device. A processing unit;

A control unit operably coupled to the actuation assembly and controlling at least one functionality thereof; 53. The apparatus of claim 52, wherein at least a subset of the measurement data is transmitted as feedback to at least one of the processing unit and the control unit. 88. The apparatus of claim 87, wherein the actuation assembly comprises a pump and the feedback is used to adjust the pump's vacuum stroke and maintain optimal fluid milking. 88. The apparatus of claim 87, wherein the actuating assembly comprises a pump and the feedback is used to regulate a cycle per minute of the pump and maintain optimal fluid milking. A method for measuring the volume of fluid pumped from a breast, comprising:

Providing a breast fluid milking device comprising an interface, an actuation assembly operably coupled to the interface, and a sensing unit;

Engaging the breast with the interface;

Activating the actuation assembly, thereby causing the interface to apply a reduced pressure to the breast;

Milking fluid from the breast;

Generating measurement data indicative of the volume of the milked fluid via the sensing unit;

Including the method. Changing operating parameters of the operating assembly based on at least a subset of the measurement data;

Activating the actuation assembly based on the altered actuation parameter;

92. The method of claim 90, further comprising:

## Description

translated from Japanese

### (Cross-reference)

This application is a non-provisional application of US Provisional Patent Application No. 61 / 937,027 [Attorney Document No. 44936-704.101] filed on Feb. 7, 2014, and the benefit of this provisional application. The entire contents of this provisional application are incorporated herein by reference.

The subject matter of this application is US Patent Application No. 14 / 221,113 filed on March 20, 2014 [Attorney Document No. 44936-703.201], and US Provisional Patent filed on July 7, 2014. Application No. 62 / 021,601 [Attorney Document No. 44936-705.101], US Provisional Patent Application No. 62 / 021,597 filed July 7, 2014 [Attorney Document No. 44936-706.101], US Provisional Patent Application No. 62 / 028,219 filed July 23, 2014 [Attorney Document Number 44936-708.101], and filed September 19, 2014 No. 62 / 052,941 [Attorney Document No. 44936-709.101], the entire contents of these applications are hereby incorporated by reference. It is use.

### (Background of the Invention)

#### (1. Field of the Invention)

The present invention relates generally to medical devices and methods, and more particularly to devices and methods for milking and collecting human breast milk.

Breast pumps are commonly used to collect breast milk so that mothers can continue breastfeeding even when they are separated from their children. Currently, there are two basic types of breast pumps: small but inefficient and manual devices that cause fatigue due to use, and efficient but bulky electric devices. For this reason, it would be desirable to provide an improved breast pump that is small and very efficient for milking and collecting milk. Additional features such as quantifying breast milk output, evaluating breast milk characteristics, and communicating with mobile devices are further desirable to enhance user convenience. At least some of these objectives will be met by the devices and methods disclosed below.

#### (2. Description of background art)

The following US patents relate to milking and collection of human breast milk. U.S. Patent Nos. 6,673,036, 6,749,582, 6,840,918, 6,887,210, 7,875,000, 8,118,772, And No. 8,216,179.

US Pat. No. 6,673,036 US Pat. No. 6,749,582 US Pat. No. 6,840,918 US Pat. No. 6,887,210 US Pat. No. 7,875,000 US Pat. No. 8,118,772 US Pat. No. 8,216,179

### (Summary of the Invention)

The present invention relates generally to medical devices and methods, and more specifically to devices and methods for milking and collecting human breast milk.

In a first aspect of the invention, a system for milking breast milk from a breast is provided. The system may comprise a milking device having an interface configured to engage the breast and an actuation assembly operably coupled to the interface. Actuation of the actuating assembly can cause the interface to apply reduced pressure to the breast and milk milk from the breast. The system further comprises a computing device configured to communicate with the milking device via a data connection.

In many embodiments, the breast is a human breast. The interface can be configured to fluidly seal against the breast.

In many embodiments, the data connection utilizes wireless communication, near field communication, or a USB cable to transmit data between at least a portion of the milking device and the computing device. The computing device may be a smartphone, tablet, or personal computer.

In many embodiments, the milking device further includes a sensing unit configured to generate measurement data indicative of one or more characteristics of breast milking. Measurement data can be transmitted to a computing device via a data connection. The computing device can include an application configured to analyze the measurement data. The computing device can transmit the measurement data to the server. The milking device can further include a processing unit configured to analyze the measurement data and generate an analysis result, and a display unit configured to display the analysis result to a user. The analysis results can be displayed in a graph, chart or table. The analysis results can be transmitted to the computing device via the data connection, and the computing device can display the analysis results to the user.

In many embodiments, the computing device can control at least one functionality of the milking device via a data connection. The functionality may comprise one or more of milking machine power, reduced pressure applied by the milking machine, or a cycle per minute of the milking machine.

In many embodiments, a notification to remind the user to milk the milk may be transmitted to the computing device via the data connection. The notification can be transmitted to at least a portion of the milking device via a data connection. Firmware updates can be transmitted to at least a portion of the milking device via a data connection.

In many embodiments, the computing device can comprise a communication module that communicates with a server over a network. A notification to remind the user to milk the milk may be transmitted from the server to the computing device. The computing device may comprise a mobile phone associated with the mobile phone number and the notification may be transmitted over the network to the mobile phone number by a short message service (SMS).

In another aspect of the present invention, a method for measuring milking of breast milk from the breast is provided. The method includes providing a breast milking apparatus having an interface, an actuation assembly operably coupled to the interface, and a sensing unit. The method further includes engaging the interface and the breast and activating the actuation assembly, thereby causing the interface to apply reduced pressure to the breast. The method further includes milking breast milk from the breast. The method may further include measuring the milking characteristics of the breast milk using the sensing unit to generate measurement data. Measurement data may be transmitted from the sensing unit to the computing device via a data connection.

In many embodiments, the measurement data may be stored in one or more data stores of the computing device. The measurement data can be analyzed via an application on the computing device and an analysis result can be generated, and the analysis result can be displayed to the user via the computing device. The analysis results can be displayed in a graph, chart, table, or any other visual, audible, or tactile indicator.

In another aspect of the invention, a method for controlling milking of breast milk from a breast is provided. The method includes providing a breast milking device having an interface and an actuation assembly operably coupled to the interface. The method further includes engaging the interface and the breast. The control signal may be received from the computing device via a data connection. The method may further include activating the actuation assembly based on the control signal and causing the interface to apply a reduced pressure to the breast. The method further includes milking breast milk from the breast.



In another aspect of the invention, an apparatus for milking breast milk from a breast is provided. The apparatus includes an interface configured to engage the breast and an actuation assembly operably coupled to the interface. Actuation of the actuating assembly can cause the interface to apply reduced pressure to the breast and milk milk from the breast. The apparatus can also include a communication module that communicates with the server over a network.

In many embodiments, the network includes an Internet network. The apparatus can further include a sensing unit configured to generate measurement data indicative of one or more characteristics of breast milking, wherein the measurement data is transmitted to a server via a network. be able to. The server can include an application configured to analyze the measurement data.

In many embodiments, the apparatus further includes a processing unit configured to analyze the measurement data and generate an analysis result, and a display unit configured to display the analysis result to a user. . The analysis result can be transmitted to the server via the network. The analysis results can be displayed on a computing device that communicates with the server.

In many embodiments, at least one functionality of the actuation assembly is controlled by an application on the server via a network. Functionality can include the power of the actuation assembly, the reduced pressure applied by the actuation assembly, or the cycles per minute of the actuation assembly.

In many embodiments, a notification to remind the user to milk the milk may be transmitted over the network to an email address. A reminder to the user to milk the milk can be transmitted to the mobile phone number over the network by a short message service (SMS), such as SMS from the server to the smartphone associated with the mobile phone number. . A notification to remind the user to milk the milk can be transmitted to the communication module via the network. The firmware update can be transmitted to the communication module via the network.

In another aspect, the present invention provides a method for measuring milking of breast milk from a breast. The method includes providing a breast milking device that includes an interface, an actuation assembly operably coupled to the interface, and a sensing unit. The interface may be engaged with the breast. The actuation assembly can be actuated to cause the interface to apply a reduced pressure to the breast. Breast milk is milked from the breast. The sensing unit may be used to measure milking characteristics of milk and generate measurement data. The measurement data may be transmitted to the server via the network.

In many embodiments, the server is a distributed computing server. The characteristics of breast milking can be measured by the sensing unit as the milk moves from the interface to a collection reservoir in fluid communication with the interface. The measurement data can be stored in one or more data stores associated with the server. The measurement data can be analyzed through an application on the server and an analysis result can be generated. The analysis results can be transmitted from the server to the computing device and displayed to the user via the computing device.

In another aspect of the invention, a method for remotely controlling milking of breast milk from a breast is provided. The method includes providing a breast milking device comprising an interface and an actuation assembly operably coupled to the interface. The interface may be engaged with the breast. A control signal can be received from the server via the network. The actuation assembly may be actuated based on the control signal and cause the interface to apply a reduced pressure to the breast. Breast milk may be milked from the breast.

In another aspect of the invention, an apparatus for measuring fluid milking from a breast is provided. The apparatus includes an interface configured to engage the breast and an actuation assembly operably coupled to the interface. Actuation of the actuating assembly causes the interface to apply reduced pressure to the breast and milk the breast from the breast. The apparatus includes a sensing unit configured to generate measurement data indicative of a volume of fluid pumped from the breast.

In many embodiments, the breast is a human breast. The interface can be configured to fluidly seal against the breast. The fluid can be breast milk or colostrum. The measurement data can indicate the volume per unit time of the milked fluid, the volume per pump stroke, or the volume per pump power cycle.

In many embodiments, the interface includes a valve that allows passage of milked fluid, and the sensing unit comprises an accelerometer that measures the movement of the valve. Measurement data can be generated based on valve motion.

In many embodiments, the apparatus can further include a second interface configured to engage the second breast. Actuation of the actuating assembly may alternately apply reduced pressure to the breast and the second breast to alternately pump fluid from the breast. The second interface can include a second valve that allows passage of fluid pumped from the second breast, and the sensing unit includes a second accelerometer that measures the position of the second valve. Can be included. The sensing unit can determine user movement based on movement detected by both the accelerometer and the second accelerometer. The user motion may be subtracted from the motion detected by at least one of the accelerometer or the second accelerometer when determining the position of at least one of the first valve or the second valve. it can.

In many embodiments, the interface may comprise an interface housing and a valve that allows passage of milked fluid. The sensing unit may comprise a first accelerometer coupled to the interface housing and a second accelerometer coupled to the valve. The first accelerometer may be configured to measure the position of the interface housing. The second accelerometer may be configured to measure the position of the valve. Measurement data may be generated based on the position of the interface housing and the position of the valve. The sensing unit can determine the background motion based on the motion detected by the first accelerometer. The background motion may be subtracted from the motion detected by the second accelerometer when determining the position of the valve.

In many embodiments, the interface may be coupled to a reservoir configured to collect milked fluid. The sensing unit may be coupled to the reservoir. The reservoir may comprise a processing unit in communication with the sensing unit, and the processing unit may be configured to receive measurement data generated by the sensing unit. The processing unit may further comprise a communication module configured to transmit the measurement data to the computing device via the data connection. The communication module of the processing unit may be configured to transmit measurement data to the server via a network.

In many embodiments, the sensing unit includes a beam block sensor configured to detect the passage of milked fluid in the vicinity of one or more sensor components of the beam block sensor. The measurement data can be generated based on the length of time that the milked fluid passes between the sensor components.

In many embodiments, the interface includes a valve that allows passage of milked fluid, and the sensing unit is configured to count milked fluid droplets passing through the valve. (CCD).

Measurement data can be generated based on one or more CCD images of the droplet.

In many embodiments, the interface includes a tube that allows passage of milked fluid and the sensing unit includes a capacitive sensor configured to sense the milked fluid contained within the tube. The interface can be coupled to a reservoir configured to collect milked fluid, and the sensing unit is configured to measure the volume of milked fluid contained in the reservoir. Can be included.

In many embodiments, the sensing unit includes a strain gauge configured to measure the volume of milked fluid. The interface can include a valve that allows passage of milked fluid, and a strain gauge can be coupled to the valve and configured to determine displacement of the valve over time. The interface can be coupled to a reservoir configured to collect milked fluid, and a strain gauge is coupled to the reservoir and configured to measure the volume of milked fluid contained within the reservoir. Can be done. The reservoir may comprise a bottom inner surface having a bellows element. The bellows element can be configured to minimize absorption by the bottom inner surface of the load applied to the bottom inner surface by the milked fluid.

In many embodiments, the sensing unit includes a camera coupled to the interface and configured to capture one or more images of the milked fluid. The apparatus can further include a processing unit configured to analyze one or more images and determine a volume of milked fluid or other characteristics of the milked fluid. The one or more images can be transmitted to a computing device configured to analyze the one or more images and determine the volume of the milked fluid. The computing device can be a smartphone. The camera can be installed on a mobile device.

In many embodiments, the apparatus further comprises a processing unit and a control unit operably coupled to the actuation assembly and controlling at least one functionality of the actuation assembly. At least a subset of the measurement data may be transmitted as feedback to at least one of the processing unit and the control unit. The actuation assembly can include a pump and feedback can be used to adjust the pump's vacuum stroke or pump's cycle per minute to maintain optimal fluid milking.

In another aspect of the invention, a method for measuring the volume of fluid pumped from a breast is provided. The method includes providing a breast fluid milking device that includes an interface, an actuation assembly operably coupled to the interface, and a sensing unit. The interface is engaged with the breast. The actuation assembly is actuated, causing the interface to apply a reduced pressure to the breast. The fluid is milked from the breast. Measurement data indicative of the volume of the milked fluid is generated via the sensing unit.

In many embodiments, the method further includes altering the operating parameters of the operating assembly based on at least a subset of the measurement data. The actuation assembly is actuated based on the altered actuation parameter.

Other objects and features of the invention will become apparent upon review of the specification, claims and appended drawings.

(Quoted by reference)

All publications, patents, and patent applications mentioned in this specification are intended to indicate that each individual publication, patent, or patent application is specifically and individually indicated to be incorporated by reference. To the same extent, it is incorporated herein by reference.

The novel features of the invention are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present invention may be obtained by reference

to the following detailed description that sets forth illustrative embodiments, in which the principles of the invention are utilized, and the accompanying drawings of which:

[illegible]

(Detailed description of the invention)

Specific embodiments of the disclosed systems, devices, and methods will now be described below with reference to the drawings. Any detailed description is not intended to suggest that any particular component, feature, or step is essential to the invention. Although the present invention is primarily concerned with breast milk, any description herein of milking and collection of milk can also be applied to other types of fluids that are milked from the breast, such as colostrum. Furthermore, the disclosed embodiments may be used in other applications, particularly in applications involving pressure differential formation and transmission, such as sleep apnea treatment and / or other remote pressure needs.



The systems, devices, and methods of the present invention provide an improved pump device for milking and collecting breast milk, such as human breast milk. In contrast to existing devices, the mechanisms described herein allow for the development of smaller and more efficient electric pump devices, thereby improving convenience and ease of use. In addition, at least some of the exemplary embodiments disclosed herein incorporate sensors for measuring milking characteristics of breast milk. The obtained data can be used, for example, as feedback to improve pump efficiency and provide users with information and / or analysis related to milking milk. Further, in a preferred embodiment, the data is transmitted to another device that communicates with the pump device, thereby allowing control, display and / or analysis of milking of the milk to be performed remotely. Can do.

FIG. 1 illustrates an exemplary embodiment of the present invention. The pump device 100 (also known as a "milking device") is also referred to as a controller 115 (also referred to as a "pendant unit") that is operatively coupled to the breast interface 105 through the breast interface 105, the tube 110, and the tube 110. May be included). The breast interface 105 includes a resilient and conforming flange 120 for engaging the breast and forming a fluid seal thereto, and a collection container 125. The controller 115 stores the power supply and the drive mechanism of the pump device 100, as described in further detail herein, and also controls the pump device 100, quantifies breast milk output, and communicates with other devices. Etc., including hardware for various functions. Tube 110 transmits a suitable energy input, such as a mechanical energy input, over a long distance from controller 115 to breast interface 105. The breast interface 105 converts the energy input to reduced pressure on the breast in a highly efficient manner, resulting in milking the milk into the collection container 125. The device 100 may further comprise one or more sensors configured to track various properties of the collected fluid, as described in further detail herein. Power may be provided to one or more sensors via a connection to the controller 115 or another power source. In embodiments in which one or more sensors are coupled to one or more portions of breast interface 105 or collection container 125, the sensors are further configured to transmit signals between the sensors and the controller. May be coupled to the controller 115 via one or more communication lines.

**Hydraulic (Hydraulic) Pump Device** The hydraulic system can reduce the required pumping force and thus reduce the size of the pump device while maintaining high pump efficiency. In a preferred embodiment, the pump device can utilize a hydraulic pump system to generate a pressure differential with respect to the breast for milking and collection of breast milk.

An exemplary hydraulic pump device is shown in FIGS. FIG. 2 illustrates a pump device 150 having a syringe 155 fluidly coupled to the breast interface 160 by a tube 165. Syringe 155 is coupled to tube 165 through three-way valve 170. The breast interface 160 includes an outlet port 175. The syringe 155 drives the fluid 180 contained in the tube 165 toward a flexible member stored in the breast interface 160 to generate the pressure differential required for milking the breast milk from the breast.

FIG. 3 illustrates another embodiment of the pump device 200. Actuation assembly 205 includes an assembly housing 210, a drive element 215, a seal 220, and a shaft 222. Drive element 215 is operatively coupled to a controller, such as controller 115, through shaft 222. Tube 225 contains fluid 230 and is fluidly coupled to actuation assembly 205 and breast interface 235. The breast interface 235 comprises an interface housing 240, a flexible membrane 245, a reservoir 250, a sealing element 255, a milking area 260, and a discharge port 265. Seal element 255 includes a deformable portion 270. Alternatively, the flexible membrane 245 may comprise a sealing element 255 having a deformable portion 270 that is fluidly sealed against the breast engaged in the breast interface 235. By doing so, it is configured to function as a sealing element. The discharge port 265 is coupled to the collection container 275 and includes a flap valve 280.

Actuating assembly 205 displaces fluid 230 contained within tube 225, which can be a flexible line. Fluid 230 occupies reservoir 250 in breast interface 235 and is coupled with flexible membrane 245. Preferably, the coupling between the flexible membrane 245, the sealing element 255, and the interface housing 240 is a liquid tight coupling such that the fluid 230 is contained within the reservoir 250 and cannot infiltrate into the milking area 260. It is. The flexible membrane 245 transmits reduced pressure from the fluid 230 to the deformable portion 270 of the sealing element 255. When the breast is engaged into the breast interface 235 by the sealing element 255 and fluidly sealed therewith, the displacement of the actuating element 215 causes a substantial vacuum to the breast through the flexible membrane 245 and the deformable portion 270. Pressure is generated, resulting in milking of the milk into the milking area 260. Alternatively, the flexible membrane 245 forms a fluid seal against the breast with which the flexible membrane 245 is engaged in the breast interface 235 and deforms the flexible membrane 245 from the fluid 230 with reduced pressure. A sealing element 255 having a deformable portion 270 may be provided to communicate to the possible portion. Milked milk is discharged into the collection container 275 through the discharge port 265. The discharge port 265 is configured with a flap valve 280 and provides passage of breast milk while maintaining a reduced pressure within the milking area 260. The collection container 275 can be any suitable container such as a bottle or bag. In many embodiments, the collection container 275 is removably coupled to the flexible membrane 245. Collection vessel 275 can be coupled directly or remotely via any suitable device, such as extended tubing. Preferably, the collection container can be quickly disconnected from other components of the pump device 200 (eg, for breast milk storage, cleaning, etc.).

The fluid of the hydraulic pump device can be any suitable fluid, such as an incompressible fluid. In many embodiments, the incompressible fluid can be a liquid such as water or oil. In many embodiments, the fluid can be a fluid having properties such that the reduced pressure applied to the fluid by the pump device does not result in degassing of the fluid. Alternatively, the fluid can be any suitable gas, such as air. Any liquid or gas suitable for use with the hydraulic system can be used for the hydraulic pump device described herein.

**Actuation Mechanisms** Many actuation mechanisms known to those skilled in the art can be utilized for actuation assembly 205. The actuation assembly 205 can be a piston assembly, a pump such as a diaphragm pump, or any other suitable actuation mechanism. The optimal configuration of the actuating assembly 205 depends on many factors, such as decompression requirements, size, power, and other needs of the pump device 200, and the characteristics of the fluid 230 such as viscosity, biocompatibility, and fluid life requirements Can do.

FIG. 3 illustrates an exemplary embodiment where the actuation assembly 205 is a piston assembly and the drive element 215 is a piston. Actuating assembly 205 includes a seal 220, such as an O-ring, rotating diaphragm seal, or wiper seal, to seal against assembly housing 210 to prevent undesired exudation of fluid 230 and allow fluid 230 to be driven. .

FIG. 4 illustrates another exemplary embodiment of an actuation assembly 300 that includes a pair of pistons 305.

In a preferred embodiment, the actuation assembly includes a drive element that is powered by a suitable drive mechanism, such as a drive mechanism in controller 115. Many drive mechanisms are known to those skilled in the art. For example, a drive element, such as drive element 215, may be electromechanically actuated by a motor or manually actuated by a suitable user-actuated interface such as a lever. Various drive modes known to those skilled in the art can be used. In particular, the implementation of an exemplary hydraulic pump device as described herein allows the use of suitable

drive modes such as direct drive and solenoids due to the reduced force requirements of the hydraulic system.

Referring now to the exemplary embodiment of FIG. 4, the piston 305 includes a coupling 310 to the crankshaft 315. Crankshaft 315 is operably coupled to motor 320 through belt drive 325. Crankshaft 315 drives a pair of pistons 305 at the same stroke timing so as to apply reduced pressure to both breasts simultaneously, a feature that is desirable for increased milk production. Alternatively, the crankshaft 315 can drive the pair of pistons 305 at any suitable stroke timing, such as alternating or offset stroke cycles. Alternate or offset stroke cycles can have the advantage of reducing the power requirements of the motor 320.

The drive mechanism can be powered by any suitable power source such as a local battery or an AC adapter. The drive mechanism can be controlled by hardware such as a built-in electronic device arranged in the controller 115.

FIG. 22 illustrates another embodiment of an alternating pump system 2200. System 2200 includes a dual milking device with an interface 2212 that is sized and shaped to match a target tissue, here a breast 2220. Reservoir 2214 is threaded or otherwise coupled to the milking device. A hydraulic line 2210 fluidly couples each milking device to a hydraulic piston assembly 2204 having an incompressible fluid, such as oil in the piston chamber, and an actuatable piston 2206. One hydraulic line 2210 is coupled to the high pressure side 2208 of the hydraulic piston, and the other hydraulic line is coupled to the low pressure side 2208 of the piston. A motor 2202 activates the piston 2206. Thus, in operation, as the piston is actuated, the high pressure side generates a higher pressure in one of the milking devices and a lower pressure in the other milking device. Lower pressure milking devices result in reduced pressure and cause milking of the milk, while the high pressure side does not milk the milk. Then, as the piston reaches the end of its stroke and reciprocates in the opposite direction, the high and low pressure sides are reversed, thereby producing milking on the opposite side and the original side does not cause milking. This process allows breast milk to be collected in an alternating fashion. The milking device, reservoir in the system may be any of the components disclosed in any of the present disclosure.

5A-5B illustrate an exemplary embodiment of an actuation assembly 350 that includes a removable coupling 355. FIG. 5A is an isometric view of the actuation assembly 350 and controller 360 coupled via a removable coupling 355. FIG. 5B is a cross-sectional view of actuation assembly 350 with removable coupling 355. Preferably, the actuation assembly 350 is removably coupled to the controller 360 and the drive mechanism stored therein. The coupling can be a mechanical coupling or any suitable rapid desorption mechanism known to those skilled in the art. The releasably coupled design allows flexibility in configuration and use of the pump device. For example, the user experience can be improved through different sized breast interfaces for compatibility with different breast sizes. In addition, this feature allows a common pump device to be used in conjunction with a replaceable breast interface, thus reducing the risk of pathogen spread. Furthermore, the removable coupling allows for easy replacement of individual parts of the pump device.

Flexible Membrane In many embodiments, such as the embodiment shown in FIG. 3, the flexible membrane 245 is located within the breast interface 235 and disposed to cover at least a portion thereof, and the interface housing 240 and A reservoir 250 is formed between the flexible membrane 245. Preferably, the flexible membrane 245 substantially deforms when exposed to negative pressure formed when the fluid 230 is displaced from the reservoir 250 by the actuation assembly 205. The amount of deformation of the flexible membrane 245 can be controlled by a number of factors (eg,

wall thickness, durometer, surface area) and can be optimized based on the pump device (eg, pump power, decompression requirements).

FIG. 6 illustrates an exemplary flexible membrane 370 having a specific thickness and durometer.

FIG. 7 illustrates another embodiment of a flexible membrane 375 with pleated features 380 for increased surface area.

Suitable materials for the flexible membrane are known to those skilled in the art. In many embodiments, the flexible membrane is designed to expand and contract when exposed to pressure from binding fluids such as silicone, polyether block amides such as PEBAX, and polychloroprene such as neoprene. It can be made from a material. Alternatively, the flexible membrane can be made from a substantially rigid material, such as stainless steel, nitinol, a high durometer polymer, or a high durometer elastomer. In these embodiments, the rigid material will be designed with stress and / or strain distribution elements that allow substantial deformation of the flexible membrane that does not exceed the yield point of the material.

FIGS. 8A and 8B illustrate a preferred embodiment of a breast interface 400 in which an outlet valve 405 is integrated into the flexible membrane 410 to control the flow of milked breast milk through the outlet port 415. The outlet valve 405 is opened when the flexible membrane 410 is relaxed, as shown in FIG. 8A, allowing fluid flow, and as shown in FIG. 8B, the flexible membrane 410 is closed when deformed to prevent fluid flow. The outlet valve 405 allows substantial vacuum pressure to be present in the milking area 420 during extraction while allowing breast milk to drain during the rest phase of the pump stroke. While many conventional breast pump valves function only with pressure differentials, the outlet valve 405 can preferably be configured to function also for mechanical movement of the flexible membrane 410. Incorporating mechanical functionality as described herein into the integrated outlet valve 405 can improve the seal of the breast interface 400 during decompression formation. Furthermore, the integrally formed outlet valve implementation within the flexible membrane 410, such as the outlet valve 405, reduces the number of parts to be cleaned.

Mechanical Pump Device FIG. 9 illustrates an alternative embodiment of a breast interface 600 where a mechanically deformable member 605 can be used instead of a flexible membrane. The mechanically deformable member 605 can be constructed from techniques similar to those used for the flexible membranes described herein. Mechanically deformable member 605 is coupled to tensioning element 610. In some cases, the tension element 610 is disposed within the axial load absorbing member 615. The axial load absorbing member 615 is disposed in the tube 620. Preferably, the tension element 610 is concentrically disposed within the axial load absorbing member 615 and the axial load absorbing member 615 is concentrically disposed within the tube 620. In an alternative configuration of the tensioning element 610, an axial load absorbing member 615 and a tube 620 can also be used.

FIG. 10 illustrates a tensioning element 610 that is coupled to the drive element 625 of the actuation assembly 630 in the assembly housing 635. Drive element 625 is operably coupled through shaft 640 to a drive mechanism, such as a drive mechanism stored in the controller. The axial load absorbing member 615 in the tube 620 is fixedly coupled to the assembly housing 635. The displacement of the drive element 625 transmits tension through the tension element 610 to the mechanical deformation member 605 and generates a reduced pressure against the breast. The drive element 625 can be actuated by a suitable drive mechanism such as the embodiments previously described herein.

The tensioning element 610 can be any suitable device such as a wire, coil, tube, braid, rope, or any combination thereof. For example, the tension element 610 can be a miniature nitinol wire with a



stainless steel braid placed around it. The tensile element 610 can be made from a number of suitable materials having a high tensile strength, such as a metal, polymer, or elastomer. The axial load absorbing member 615 can be made from any suitable material that is axially synthetic, such as metal or polymer, and is configured in any suitable geometric shape that is axially synthetic, such as a tube or coil. Can.

Fluid collection and quantification systems In many cases, collection such as milk production and collection, such as the amount of milk production (eg, volume, weight), frequency of milking (eg, time, date), and / or milking duration It may be desirable to measure and track various properties of the treated fluid. In existing approaches, tracking milk production is typically accomplished by manual measurement and recording. The exemplary embodiments of the devices described herein provide digital-based means for improved convenience, efficiency, and accuracy, and can automatically measure and track breast milk production. Good. For example, a sensor can be used to measure the volume of milked milk. In preferred embodiments, the volume is measured as volume per unit time, volume per pump stroke (eg, stroke of the actuation assembly), or volume per pump power cycle (eg, power cycle of the actuation assembly). Can do.

In an exemplary embodiment, the pump device described herein may use one or more measurement data to generate one or more characteristics of breast milking, such as the volume of milk pumped. Including more sensors. Any description herein relating to measuring volume can also be applied to measuring other properties, and vice versa. Any suitable type of sensor can be used, such as accelerometers, Hall effect sensors, and photodiode / LED sensors, CCD sensors, cameras, and other imaging devices, capacitive sensors, strain gauges, etc. The sensors can be used in any number and combination. The sensor can be located at any location suitable for monitoring fluid flow from the breast, such as on or near the breast interface (eg, milking area 260, drain port 265, collection container 275). In embodiments where breast milk is milked simultaneously from a pair of breasts via a pair of breast interfaces, the sensor is located on or near both breast interfaces or only one of the breast interfaces. be able to. The sensor may be integrally formed with the pump device or permanently attached thereto. Alternatively, the sensor may be provided separately and coupled to the pump device prior to use.

FIGS. 11A and 11B illustrate an exemplary embodiment of a breast interface 450 with a valve integrated sensor 455. Sensor 455 is preferably located in a valve, such as flap valve 460, but is also located in outlet valve 465 or any other valve (eg, on or near the collection vessel) that is opened by fluid flow. May be. In the exemplary embodiment, sensor 455 includes an accelerometer that measures valve position and / or movement, such as the length of time that the valve is opened, and the resulting measurement data is for quantifying fluid flow. Can be queried. Preferably, breast interface 450 is used in conjunction with a second identical breast interface to milk milk from a pair of breasts in parallel (eg, simultaneously, alternately or sequentially). A pair of accelerometers can be used to detect the position and / or movement of the corresponding valve in each interface. In some cases, the user's movement may cause the accelerometer to generate a motion signal that is misinterpreted as a valve motion. Thus, in a preferred embodiment, a preferred approach is used to distinguish between signals resulting from user movement and signals generated by valve movement. For example, the pump device can be configured to milk milk alternately from each breast so that the corresponding valves are also opened alternately. As a result, motion detected simultaneously from both accelerometers can be considered to have resulted from user motion, not from valve motion. User motion can be subtracted from the total motion signal obtained by the accelerometer to obtain valve motion, thereby determining the position of each valve. Alternatively or in combination, the sensor 455 may comprise a set of background motion accelerometers in addition to the set of valve accelerometers, the background motion accelerometer, as described in further detail herein. It is

configured to measure background motion including user motion. The background motion measured by the background motion accelerometer may be subtracted from the motion measured by the valve accelerometer to obtain an isolated valve motion.

FIG. 11C more clearly illustrates an embodiment with an accelerometer 470. The accelerometer 470 is coupled to a valve 476 on the output of the milking device 472 having a breast interface 474 (which may also be referred to herein as a distal assembly). Valve 476 may be a flap valve, a duckbill valve, or the like. The milking device and the breast interface may be any of the embodiments disclosed herein. As breast milk 468 is milked, it is collected at the output of the device. When sufficient fluid is collected, the flap valve 470 opens and the breast milk 468 is drained into the reservoir 462 and collects the layer 464 therein. The reservoir 462 is preferably threadably connected to the milking device 472 so that it can be easily installed and removed. The movement of valve 476 is tracked using accelerometer 470. Data from the accelerometer is then processed, transmitted, or displayed using any of the methods or means disclosed herein.

FIGS. 11L-11N illustrate an exemplary embodiment having a background motion accelerometer 473 and a valve motion accelerometer 478. FIG. 11L is an isometric view of an exemplary embodiment. FIG. 11M is a side cross-sectional view of an exemplary embodiment. The background motion accelerometer 473 may be coupled to a portion of the breast interface 235, for example, the housing 240 of the breast interface. The valve accelerometer 478 may be coupled to a valve 471 that is configured to open in response to pressure or weight applied by a flap valve, duckbill valve, or milked breast milk 468. Any other valve may be used. Background motion accelerometer 473 and valve motion accelerometer 478 may be coupled to a power source, eg, controller 115, through power line 482. The background motion accelerometer 473 and the valve motion accelerometer 478 may further be coupled via a communication line 480 to a processing device or communication module of a pump control unit, such as the controller 115. Alternatively or in combination, the accelerometer may be coupled to a communication module disposed on a portion of the breast interface or reservoir, the communication module configured to communicate wirelessly with a controller or computing device. . The power line 482 and the communication line 480 may comprise one or more wires and are located in different channels or the same channel 484 of the flexible tubing 110 to connect the breast interface 235 to the actuation assembly of the pump device. May be combined. The background motion accelerometer 473 may be disposed on the surface of the housing 240 so as to be positioned in proximity to the power line 482 and the communication line 480. Similarly, the valve motion accelerometer 478 may be placed on the surface of the valve 471 so as to be positioned proximate to the power line and communication line. The valve 471 may be arranged in a configuration such that a valve accelerometer 478 disposed thereon can be positioned in proximity to the power and communication lines. Preferably, the background motion accelerometer 473 may be placed in a location and orientation whose sensing axis is aligned with the axis of the valve accelerometer 471 so as to optimize the consistency of the position data generated by the accelerometer. Good.

As shown in FIG. 11M, the milked milk 468 can enter the milking area 260 of the breast interface 235 and subsequently enter the drain port 265 coupled to the collection container. The fluid flow of breast milk 468 can generate pressure on the valve 471 and cause the valve 471 to open. For example, valve 471 may be displaced in the direction indicated by arrow 485 up to configuration 486. The movement of the valve 471 may be tracked by the valve motion accelerometer 478. Valve motion accelerometer 478 can often measure background motion that is not associated with valve motion 471, such as user motion, in addition to valve motion 471. In order to normalize the measurement of the valve motion accelerometer 478 relative to the background motion, the background motion accelerometer 473 measures the overall pump device in space to measure the background motion of the device unrelated to the valve motion 471. Can be configured to track global movement. Data generated by

accelerometers 473 and 478 may be transmitted via communication line 480 to the communication module of the pump control unit, which communicates the data to the pump control unit for data analysis and / or display. Or it may be configured to transmit to any processing device of another computing device. Alternatively, or in combination, the data generated by the accelerometer may be transmitted wirelessly via a communication module that is integrated with a portion of the breast interface or reservoir.

FIG. 11N shows an exemplary graph of the motion signal generated by the background motion accelerometer 473 and the valve motion accelerometer 478. As shown in the graph, the valve signal 487 generated by the valve motion accelerometer 478 is different from the background signal 488 generated by the background motion accelerometer 473. To exclude or minimize the background motion contribution to the measured valve motion, the background signal 488 may be subtracted from the valve signal 487 to produce a normalized valve signal 489.

In other exemplary embodiments, the pump device described herein is in a suitable location within the pump device (eg, within or near a valve, outlet port, or other component that allows fluid passage). One or more beam block sensors (eg, infrared-based, laser-based, etc.) installed in The beam block sensor can include a plurality of sensor components and can be configured to detect the passage of fluid between or near one or more of the components. Preferably, the sensor can be configured to generate a signal when the milked fluid blocks the beam by passing between the beam emitter and the beam detector. The resulting signal can be used to generate measurement data indicative of the volume of the milked fluid. For example, the measurement data can be based on the length of time that the fluid passes between or near sensor components.

FIG. 11D illustrates an exemplary embodiment of a breast milking device that employs a beam block sensor 477. Milking device 472 includes a breast interface 474 and a reservoir 462. The reservoir is threaded or otherwise coupled to the milking device 466. Any of the exemplary embodiments disclosed herein, such as milking devices, interfaces, reservoirs, etc., may be used in the exemplary system. The beam block sensor 477 is positioned adjacent to the output of the milking device, thus blocking and milking the light beam 477a as the milk droplet 468 is discharged from the milking device outlet into the reservoir 462. Allows fluid measurement. Fluid is collected in layer 464 within reservoir 462. Data from the sensor can then be processed, transmitted, or otherwise displayed using any of the methods disclosed herein.

In another exemplary embodiment, the pump device described herein is a milking volume, such as a charge coupled device (CCD), an active pixel sensor in a complementary metal-oxide-semiconductor (CMOS), or a camera. Can be included to include one or more image sensors for capturing an image of the fluid. The image sensor may be integrated with or coupled to a suitable part of the pump device. Conversely, the image sensor can be located on another device separate from the pump device, such as a smartphone or other mobile device. In an exemplary embodiment, the breast interface includes a valve that allows passage of milked fluid, as previously described herein, and a suitable image sensor captures an image of the fluid passing through the valve. Therefore, it is positioned on or near the valve. Preferably, the image sensor is operably coupled to a processing unit configured to analyze the image data (eg, using a suitable image analysis algorithm) to determine fluid volume. For example, an image sensor can be used to capture an image of a fluid droplet, and the image can be analyzed to count the number of droplets. In some instances, the image data can be transmitted to a computing device (eg, a smartphone) for analysis, as described in further detail below.

FIG. 11E illustrates an exemplary embodiment having a CCD or CMOS device 479 adjacent to the exit of the milking device. Milking device 472 includes an interface 474 and a reservoir 462, any of which may be any of the embodiments disclosed herein. As breast milk 468 is milked, it passes through the outlet of the milking device beyond the CCD or CMOS 479, which detects fluid and allows its quantification as described above. Breast milk 468 then accumulates in layer 464 within reservoir 462. Data from device 479 may then be processed, transmitted, or otherwise displayed using any of the methods disclosed herein.

FIG. 11F illustrates an exemplary embodiment of characterizing milked breast milk using an image of the reservoir. Once breast milk 468 is collected in reservoir 462, the reservoir may optionally be removed from the milking device. A cell phone with a suitable application to analyze the photos, determine the amount of milked milk, and optionally provide other details about the milked milk, then take a photo 463a of the reservoir. The data is processed, transmitted, or otherwise displayed using any of the methods disclosed herein.

FIG. 11G illustrates an alternative embodiment of the optical sensor system. After breast milk 468 is milked and collected in reservoir 462, a camera in pump control unit 465 obtains an image of breast milk in the reservoir and analyzes it for volume or other characteristics. May be used. The pump control 465 may be any of the pump controls described herein, and the data is processed, transmitted, or displayed using any of the methods disclosed herein. May be.

In some exemplary embodiments, the pump devices described herein can employ one or more capacitive sensors to measure fluid volume. The capacitive sensor allows passage of fluid from any suitable part of the pump device, such as fluid contained within the collection reservoir and / or breast interface (eg, milking area 260, valve, outlet port, or tubing interface) The volume of fluid contained within the component.

11H-11I illustrate an exemplary embodiment of a milking device using a capacitive sensor. The milking device 472 may be any of the milking devices disclosed herein and similarly has an interface 474, which may be any of the interfaces disclosed herein. Reservoir 462 is threaded 466 or otherwise coupled to the milking device, and the reservoir may be any of the reservoirs described herein. As breast milk 468 is milked and collected at the outlet of the milking device, it passes through the volume sensor 475, which then allows the fluid volume to be measured. FIG. 11I is similar to the embodiment in FIG. 11H, but the main difference is that the capacitive sensor 475a is located in the reservoir 462 near the bottom rather than in the outlet of the milking device. Data from the sensor in any embodiment may then be processed, transmitted, or displayed using any of the techniques described herein.

In other exemplary embodiments, one or more strain gauges can be used to measure the volume of the milked fluid. The strain gauge can be installed at any suitable location within the pump device. For example, the strain gauge may be coupled to a flap valve (or any other valve that allows passage of milked fluid) and configured to determine volume based on the displacement of the valve over time. it can. Alternatively or additionally, a strain gauge can be coupled to the collection reservoir and configured to measure the volume of milked fluid contained within the reservoir.

FIG. 11J illustrates an exemplary embodiment of a strain gauge. The milking device 472 includes an interface 474, a thread 466 or otherwise coupled thereto 466, a reservoir 462. Any part of the system may be any of the components described elsewhere herein. As the milk is milked 468, it accumulates in the outlet of the milking device. Ultimately, the accumulated breast milk weight is sufficient to activate and open valve 476. A strain gauge 481 is coupled to the flap valve and the sensor is then used to collect data regarding the movement of the valve, thus it correlates with the collected fluid.



Fluid accumulates in layer 464 within reservoir 462. Data from the sensor is then processed, transmitted, or displayed using any of the methods disclosed herein.

FIG. 11K illustrates an alternative embodiment of a strain gauge. This embodiment generally takes the same form as the previous embodiment, the main difference being that the collected fluid layer 464 is placed on a plate 483 that bears the weight of the collected fluid. . Thus, as the weight increases or decreases, the strain gauge 481a disposed under the plate 483 detects the weight change, which can be correlated to the collected fluid volume. Data from the sensor is then processed, transmitted, or displayed according to any of the methods disclosed herein.

FIGS. 11O-11Q illustrate an exemplary embodiment of a strain gauge or force sensitive resistor (FSR) comprising an integrated processing unit. FIG. 11O is a cross-sectional view of the embodiment. The strain gauge 490 is located in the bottom of the reservoir, such as the reservoir 462 or any reservoir described herein, in a configuration that places the load 469 of the milked milk 468 on the sensor area of the strain gauge or FSR 490. May be integrated. The strain gauge 490 may include a small force sensitive resistor that adjusts its resistance based on the compressive force applied thereto. To maximize the sensitivity of the strain gauge 490 to the load 469, the bottom inner surface 491 of the reservoir 462 may be designed to minimize the absorption of the load 469 as the load is transmitted to the strain gauge. Good. For example, the bottom inner surface 491 may comprise a bellows element 492, allowing the surface 491 to move up and down by extending the surface 491, thereby minimizing the absorption of the load 469. Preferably, reservoir 462 comprises a self-contained electronic device that collects, processes, and communicates data generated using strain gauge 490. A strain gauge 490 may be mounted on the support 493 and coupled to the processing unit 494, as shown in FIG. 11P, which is an exploded view of the embodiment in FIG. Power may be supplied to the processing unit 494 via a direct contact connection such as a battery or cable or pad connector, or preferably via an inductive charging system. The inductive charging system may include a battery 495 coupled to the processing unit and a wireless charger 496 coupled to the battery and may be charged using inductive charging methods known in the art. FIG. 11Q is a detailed view of the processing unit 494. The processing unit 494 may comprise a printed circuit board (PCB) that stores one or more of the microcontroller 494a, the communication module 494b, the strain gauge connection 494c, the power connection 494d, and the timer 494e. . The processing unit 494 may receive a signal from the strain gauge 490 through the strain gauge connection 494c and the signal may be transmitted to the microcontroller 494a. The microcontroller 494a may comprise a non-transitory computer readable medium comprising instructions for collecting and processing signals received from the strain gauge 490. The microcontroller 494a may further comprise instructions for transmitting the collected and / or processed signals to the communication module 494b. The communication module 494b may include a wireless transmitter / receiver such as a Blue Tooth module, for example. Communication module 494b may be configured to transmit strain gauge data to another computing device, such as a pump control unit of a milking device or a mobile phone, for data analysis and / or display.

The integrated processing unit of the embodiment of FIGS. 11O-11Q may also be suitably combined with any other sensor described herein. A milking device with a reservoir with an integrated sensor and processing unit as described helps to automate the management and monitoring of breast milk production, thus reducing the need to manually maintain records related to breast milk production Can do. For example, a strain gauge system as described can monitor the amount of milk produced and automatically process the data and send it to a computing device where the user can easily access the information. . Such a system can greatly improve the convenience for the user and can help reduce human errors associated with manual record keeping.

In an exemplary embodiment, some or all of the measurement data collected by the sensor can be fed back to the pump device to optimize fluid milking. Preferably, the feedback is a processing unit and / or control unit (eg, suitable hardware located within controller 115) of the pump device configured to control one or more functionalities of the actuation assembly. Can be transmitted. Based on the feedback, the processing unit can determine changes to the operating parameters of the operating assembly to achieve and / or maintain optimal fluid milking. For example, the feedback can be used to determine the adjustment of the pump, piston assembly, or any other suitable actuation assembly to a reduced pressure stroke or cycle per minute.

FIG. 21 illustrates an exemplary milking system with feedback control. The system is preferably sized and shaped to mate with a pump unit 2100 and a target anatomy, here a breast 2112, including a controller and processor 2104 and a motor 2102 for operating the device. Assembly 2110. Any of the elements in the present exemplary system may be any of the components disclosed elsewhere herein in other exemplary embodiments. In this embodiment, feedback 2106 from a sensor that monitors milked milk in the milking device 2110 is transmitted from the distal assembly (milking device with interface) to the controller and processor 2104. The data is processed and this information is used to provide instructions to the motor 2102 to increase or decrease the operation of the milking device, which is then sent back to the milking device or distal assembly 2110 via communication 2108. The feedback information may also be used to provide instructions to the motor 2012 to change the number of strokes or cycles per minute of the milking device. Any of the embodiments herein may include such a feedback loop.

FIG. 12 illustrates an exemplary embodiment of a controller 500 for a pump device that includes a display screen 505. The controller 500 may include suitable hardware for collecting, processing, and storing milking data as described herein, and analysis results obtained from processing the milking data. In the preferred embodiment, this information is displayed to the user of the pump device via display screen 505. Further, as shown in FIG. 13, information can also be transmitted from the controller 500 and displayed on a separate computing device, such as the mobile device 510, as described in more detail below. Information can be presented in any suitable form, including graphs, charts, tables, images, or other visual elements such as one or more lights of different colors. Alternatively or in combination, the information may be provided via an audible indicator. Information may be presented in a form that is static or dynamic (eg, updated in real time, etc.). In addition, the controller 500 includes buttons 515 and input devices that allow a user to interact with displayed information, such as a keyboard, joystick, touch screen, switch, or knob, or a suitable combination thereof. be able to.

Communicating with a computing device in any of the embodiments disclosed herein, the pump device described herein can communicate with another entity, such as one or more computing devices and / or servers. Can be configured to communicate. Exemplary computing devices include personal computers, laptops, tablets, and mobile devices (eg, smartphones, cell phones). The servers described herein can be implemented across physical hardware, virtualized computing resources (eg, virtual machines), or any suitable combination thereof. In a preferred embodiment, the server is a distributed computing server (also known as a cloud server) that utilizes any suitable combination of public and / or private distributed computing resources. The computing device and / or server may be in close proximity to the pump device (short range communication) or may be remotely located from the pump device (long range communication). Any description herein relating to communication between a computing device and a pump device can also be applied to communication between a server and a pump device and vice versa.

FIG. 13 illustrates short range communication 515 between the controller 500 of the pump device and the mobile device 510. The communication 515 can use a wireless communication method as will be described below. In many embodiments, the controller 500 and mobile device 510 are also capable of long-range communication.

FIG. 14 is a schematic diagram of a pump device 800 in communication with a computing device 805 and a server 810. The pump device 800 includes one or more breast interfaces 815, an actuation assembly 820, a sensing unit 825, and a communication module 835. Preferably, the communication module 830 is implemented across suitable hardware in the controller (eg, controller 500) of the pump device. The pump device 800 can communicate with the computing device 805 and the server 810 via the communication module 830. In many embodiments, the communication module 830 is communicatively coupled to the computing device 805 and the server 810 via first and second data connections 835, 840. Further, server 810 may be communicatively coupled to computing device 805 via third data connection 845. Although the pump device 800 is depicted herein as communicating directly with the computing device 805 and the server 810, other configurations are also possible. For example, pump device 800 may communicate indirectly with server 810 via computing device 805, or vice versa. Conversely, server 810 may communicate indirectly with pump device 800 via computing device 805, and computing device 805 may communicate with pump device 800 via server 810. Any description herein regarding communication between pump device 800, computing device 805, or server 810 can be applied to direct communication as well as indirect communication between these entities.

Data connections 835, 840, and 845 can utilize any suitable communication method for transmitting data between pump device 800, computing device 805, and server 810. Such communication methods may include wired communication (eg, wire, cable such as USB cable, optical fiber) and / or wireless communication (Bluetooth®, WiFi, near field communication). In many embodiments, data is transmitted over one or more networks, such as a local area network (LAN), a wide area network (WAN), a telecommunications network, the Internet, or a suitable combination thereof. be able to.

In the exemplary embodiment, pump device 800 transmits milking data for breast milk to computing device 805 or server 810 (directly or indirectly). Breast milking data may include measurement data generated by the sensing unit 825 of the pump device 800, as previously described herein. In many embodiments, the pump device 800 analyzes the measurement data (eg, using suitable built-in hardware and / or software) and transmits the analysis results to the computing device 805 or server 810. Alternatively, the measurement data can be analyzed by computing device 805 or server 810, such as using one or more applications. A computing device 805 or server 810 may be associated with data storage for storage of measurement data and / or analysis results.

The application (of computing device 805 or server 810) also collects and aggregates measurement data and / or analysis results, as described earlier in this specification, in a suitable format (eg, chart, table, graph, image). Etc.) can be displayed to the user. Preferably, the application allows the user to overlay information such as lifestyle choices, meals, and strategies to increase breast milk output to facilitate comparison of such information with milk output statistics. , Including additional features. The analysis and display functionality described herein may be performed by a single entity or any suitable combination of entities. For example, in many embodiments, data analysis can be performed by server 810 and the analysis results can be transmitted to pump device 800 or computing device 805 for display to the user.

In addition, the computing device 805 or server 810 may be configured to power the pump device 800 or a portion thereof (eg, the actuation assembly 820), such as power, applied reduced pressure

(via the interface 815), or cycles per minute. An application configured to control at least one functionality can be included. For example, the communication module 830 can receive control signals from the computing device 805 and / or the server 810 and transmit the control signals to the actuation assembly 820 to effect the desired actuation. In a preferred embodiment, the control signal is based on the measurement data provided by the sensing unit 825, using feedback provided by the pump device 800 as such feedback, as previously described herein. Can be generated. In addition, the computing device 805 or server 810 may implement machine learning techniques for controlling the pump device 800 to improve and optimize pump performance over time.

Further, the pump device 800, the computing device 805, and / or the server 810 can be configured to provide a reminder to the user to milk the breast milk. Such notifications can help avoid loss of pump sessions and thus reduce the occurrence of associated complications such as mastitis. The notification may be generated based on previously collected milking data for breast milk, such as data regarding milking frequency and / or timing of previous pump sessions, and based on user preferences. Preferably, the notification functionality is included in a suitable application that runs on computing device 805 or server 810. For example, the pump device 800 sends information about the pump usage time to the computing device 805 or server 810 so that the application can identify when the pumping has occurred and identify the reminder at the desired pump time. can do.

Notifications can be provided using any suitable method and in any suitable form. For example, the notification is generated by computing device 805 or server 810 and transmitted to pump device 800 (eg, communication module 830) and displayed to the user (eg, on the display of pump device 800 such as display screen 505). )be able to. Conversely, the notification can be generated by pump device 800 and transmitted to computing device 805 and / or server 810. In many embodiments, the notification is displayed to the user by the computing device 805. Alternatively, pump device 800, computing device 805, and / or server 810 can use other methods to provide notifications to the user. For example, the notification can be sent to an email address, via a short message service (SMS) to a smartphone or other mobile device associated with a mobile phone number, or to a web page accessible by the user.

Other types of data can also be transmitted between pump device 800, computing device 805, and / or server 810. For example, in many embodiments, firmware updates for one or more components of pump device 800 can be transmitted from computing device 805 and / or server 810 to pump device 800.

FIG. 17 illustrates another exemplary embodiment of a system for monitoring milking or other fluids of breast milk. The system 1700 includes a pump unit 1702, a distal assembly 1706 (sometimes referred to herein as an interface), a wireless communication transmitter and receiver 1709, 1712, a computing device 1714, a remote server. 1718. The pump unit 1702 may be any of the pump units described herein or known in the art, and the distal assembly 1706 may also be described herein. Or any of those known in the art. Distal assembly 1706 is preferably sized and shaped to match the target anatomy, which in this exemplary embodiment is breast 1708. Pump unit 1702 operates distal assembly 1706 1704 to produce milk from breast 1708 using any of the activation mechanisms disclosed herein. The transmitter 1709 is preferably disposed on or adjacent to the pump unit and is configured to transmit data 1710 from the pump unit to a receiver 1712 on the computing device 1714. Data may be transmitted wirelessly using methods known in the art, such as those disclosed herein. In an alternative embodiment, a wired connection, such as with a USB cable, may be used to operably couple pump 1702 and computing device 1714 together. The computing device may be a smartphone, tablet, personal computer, or any other electronic computing device that can display data transmitted from the pump unit 1702. The computing device may also send information back to the



pump unit to help control the operation of the distal assembly. Computing device 1714 may also communicate 1716 with remote server 1718, which may store or display data. Access to remote service 1718 may be by the Internet or other means known in the art, so that cloud-based data can be easily accessed from any other device using Internet access. obtain.

FIG. 18 illustrates another exemplary embodiment of a system 1800 for milking milk. In this embodiment, system 1800 includes a pump unit 1802, a distal assembly 1806, and a cloud-based or remote server 1812. The pump unit 1802 can be any of the pumps disclosed herein and is operably coupled to a distal assembly 1806 that is sized and shaped to match a target, such as a breast 1808. The distal assembly may be any of the distal assemblies described herein. Pump unit 1802 activates the distal assembly 1804 using any of the mechanisms disclosed herein to produce milk from breast 1808. Pump unit 1802 also includes a transmitter and receiver 1809 for transmitting pump data 1810 to remote server 1812, which in this embodiment is a cloud-based server. Thus, data may be transmitted to a remote service via the Internet and accessed from a cloud-based server via the Internet by pump 1802 or any other computing device. Preferably, communication with the cloud-based server is performed by wireless communication.

19A-19C illustrate an exemplary computing device display 1904. FIG. For example, FIG. 19A illustrates an exemplary display on the mobile phone 1902 and schematically illustrates breast milk production, time of the last pump session, goal achievement graphics, and graphics illustrating user fluid consumption. In addition, display 1904 may also provide user incentives or user feedback based on the amount of milk production. FIG. 19B is an enlarged view of the display 1904 in FIG. 19A. FIG. 19C illustrates additional information that the display 1904 may show when the touch screen is activated (eg, by swiping or touching the screen). For example, the milked milk volume is shown after the "Final Pump Session" section of the display is selected. Some or all items may be expanded as shown in FIG. 19C as well. Additional information, or in some situations, less information may be displayed as desired.

20A-20B illustrate another exemplary display that may be used in a breast milking system. For example, FIG. 20A is an exemplary display 2002 on any of the computing devices disclosed herein and operably coupled with any of the pump units described herein. The display may show the average volume of breast milk milked over any period, along with the average duration of the milking session during that same period. Graphics (eg, bar charts, pie charts, xy plots, etc.) may be used here to show the milked volume during individual sessions over the course of several days from Monday to Friday. The display may allow the user to annotate the display so that a lost session may be considered if, for example, the session is omitted due to travel, the display may be May indicate a trip. Other annotations may also be added here, such as when a food or nutritional supplement is taken, which is hops or fenugreek. This allows the user to remind when a milked milk sample is obtained for consumption of food or nutritional supplements. The display may have other function buttons such as seeking advice, accessing the cloud, setting an alarm, taking notes, storing data, or establishing system preferences. Communication between the computing device and the pump unit in FIGS. 20A-20B is discussed more fully above with respect to FIG.

FIG. 20B illustrates an exemplary display 2004 that may be on a computing device in the system or, more preferably, on any of the pumps disclosed herein. The display 2004 is similar to a dashboard gauge and shows the volume and time of the milked and collected fluid. Other information may also be displayed.

Experimental Data FIGS. 15 and 16 illustrate experimental pump operation data obtained from a commercial breast pump device and an exemplary embodiment of the present invention. The

exemplary embodiment utilizes an incompressible fluid for pumping and has a maximum hydraulic fluid volume of 4 cc, while commercially available devices utilize air for pumping and have a maximum volume of 114 cc. did.

FIG. 15 illustrates a graph of pump performance as quantified by the reduced pressure generated per stroke. For the exemplary embodiment, pressure measurements are made on fluid volumes 1 cc, 2 cc, 3 cc, and 4 cc displaced by the pump, and the stroke number corresponds to volume cc. For commercially available devices, one of seven equally spaced positions along the vacuum adjustment gauge representing 46 cc, 57 cc, 68 cc, 80 cc, 91 cc, 103 cc, and 114 cc of the fluid volume displaced by the pump, respectively. Measurement is performed using a pump set to, and the stroke number corresponds to the position number. Curve 700 corresponds to an exemplary embodiment and curve 705 corresponds to a commercially available device. The exemplary embodiment produced higher levels of reduced pressure per displacement volume compared to commercially available devices, with the highest reduced pressure being -240.5 mmHg and -177.9 mmHg, respectively.

FIG. 16 illustrates a graph of pump efficiency as measured by maximum reduced pressure per maximum volume of displaced fluid, with bar 710 corresponding to an exemplary embodiment and bar 715 corresponding to a commercially available device. . The exemplary embodiment demonstrated a 42-fold increase in pump efficiency compared to commercially available devices, with efficiencies of -71.1 mmHg / cc and -1.7 mmHg / cc, respectively.

The various techniques described herein may be partially or fully performed using code that can be stored on storage media and computer-readable media and that can be executed by one or more processors of a computer system. May be implemented. Storage media and computer readable media containing code or part of code include: RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disc (DVD) or other optical storage, magnetic cassette, Magnetic tape, magnetic disk storage or other magnetic storage device, solid state drive (SSD) or other solid state storage device, or can be used to store desired information and accessed by system devices Implemented in any method or technique for storing and / or transmitting information such as computer readable instructions, data structures, program modules, or other data, including any other medium Not volatile and non-volatile Nonvolatile, including storage media and communication media, such as removable and non-removable media, may include any suitable medium that is known or used in the art. Based on the disclosure and teachings provided herein, one of ordinary skill in the art may appreciate other ways and / or methods to implement various embodiments.

It should be understood that different aspects of the present invention may be recognized individually, collectively, or in combination with each other. Any suitable element or feature of the embodiments described herein can be combined with or substituted for the element or feature of any other embodiment.

While preferred embodiments of the present invention have been shown and described herein, it will be appreciated by those skilled in the art that such embodiments are presented by way of example only. Many variations, modifications, and alternatives can now be devised by those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention described herein can be used to practice the invention. The following claims are intended to define the scope of the invention, and the methods, configurations, and equivalents within the scope of these claims are intended to be encompassed thereby.

## Patent Citations (12)

Publication number	Priority date	Publication date	Assignee	Title
Family To Family Citations				
AU2503200A *	1999-01-12	2000-08-01	Elena Taggart Medo	Breast pump apparatus for facilitating a milk ejection reflex and methods of using
US6676631B1 *	1999-12-10	2004-01-13	Medela Holding Ag	Vacuum and rate control for a breastpump
US6808517B2 *	1999-12-10	2004-10-26	Medela Holding Ag	Suction sequences for a breastpump
AT521228T *	2004-01-08	2011-09-15	Delaval Holding Ab	MELK PROCESS AND METHOD OF PREPARATION
CN101489601B *	2006-07-18	2011-11-23	美德乐控股公司	Breastpump set
US7972297B2 *	2008-11-07	2011-07-05	Simplisse, Inc.	Breast cup assembly for a breast pump
US7835230B1 *	2009-05-05	2010-11-16	Stephanie Chang	Infant feeding management system
CN103347561B *	2010-12-08	2016-09-07	康沃特克科技公司	For assessing the integrated system of wound exudate
NL2007731C2 *	2011-11-07	2013-05-08	Lely Patent Nv	A method and apparatus for monitoring a milking process.
US20130125821A1 *	2011-11-22	2013-05-23	Tag It Technologies Limited	Milking process monitoring
US9808563B2 *	2012-05-03	2017-11-07	Genadyne Biotechnologies, Inc.	Breast pump and system or program for pumping breasts
WO2014160065A2 *	2013-03-13	2014-10-02	Medela Holding Ag	System and method for managing a supply of breast milk

\* Cited by examiner, † Cited by third party

## Cited By (14)



Publication number	Priority date	Publication date	Assignee	Title
--------------------	---------------	------------------	----------	-------

JP2020523179A *	2017-06-15	2020-08-06	チアロ テクノロジ ー リミテッド Ch i a r o T e c h n o l o g y L i m i t e d	Milking system
JP2020531134A *	2017-08-21	2020-11-05	バメト アクチエン ゲゼルシャフト B a m e d A g	Infant oral simulator
JP2021523801A *	2018-05-25	2021-09-09	メデラ ホールディ ング アーゲー	Baby bottle with breast pump
Family To Family Citations				
ES2751940T3	2014-07-22	2020-04-02	Exploramed Nc7 Inc	Breast pump system and methods
WO2016014488A1	2014-07-22	2016-01-28	Exploramed Nc7, Llc	Breast pump system and methods
WO2016014483A1	2014-07-22	2016-01-28	Exploramed Nc7, Llc	Breast pump system and methods
AU2015292839B2	2014-07-22	2019-09-12	Willow Innovations, Inc.	Breast pump system and methods
SG11201700862VA	2014-08-11	2017-03-30	Joelle K Barral	Synchronizing breast pumping with infant feeding
WO2016044368A1	2014-09-16	2016-03-24	Exploramed Nc7, Inc.	Systems, devices and methods for assessing milk volume expressed from a breast
CN105148341A *	2015-08-25	2015-12-16	陈俊波	Time-division pumping mode of double-side breast pump
EP3393540B1	2015-12-23	2019-11-20	Koninklijke Philips N.V.	Breast pump, method and computer program
WO2017139437A1	2016-02-10	2017-08-17	Exploramed Nc7, Inc.	Breast pump assembly and methods
EP3299043A1 *	2016-09-22	2018-03-28	Medela Holding AG	Breast hood unit



WO2022173352A1 *	2021-02-11	2022-08-18	Delaval Holding Ab	A method of controlling a milking arrangement, and a milking arrangement
------------------	------------	------------	--------------------	--

\* Cited by examiner, † Cited by third party, ‡ Family to family citation

## Similar Documents

Publication	Publication Date	Title
JP2017509379A	2017-04-06	Method, apparatus and system for milking human breast milk
US20150283311A1	2015-10-08	Method, apparatus, and system for expression of human breast milk
JP6728220B2	2020-07-22	Improved milking system with detection, feedback and connectivity
JP2016514516A	2016-05-23	Methods, apparatus, and systems for expression and quantification of human breast milk
US20200061265A1	2020-02-27	Breast pump assembly with remote interface
US20160295681A1	2016-10-13	Fluid measurement accessory for breast pumps
WO2008150633A3	2009-02-19	Wireless monitor for a personal medical device system
RU2729444C2	2020-08-06	Breast pump, a method for determining the amount of expressed milk and an information carrier with a program recorded thereon for realizing the method
TWI559254B	2016-11-21	Tele-care management systems and methods for peritoneal dialysis
US20210060220A1	2021-03-04	Breast pump assembly with customized and variable functionality
EP3517148A1	2019-07-31	Breast status determination
AU2020203701A1	2020-06-25	Pump apparatus and methods for expression of human breast milk
US20220203001A1	2022-06-30	Smart connected breast pump
JP2022100769A	2022-07-06	Completely closed perfusate delivery system and completely closed perfusate circulation system



## Priority And Related Applications

### Priority Applications (3)

Application	Priority date	Filing date	Title
US201451937027P	2014-02-07	2014-02-07	US Provisional Application
US61/937,027		2014-02-07	
PCT/US2015/014901	2014-02-07	2015-02-06	Methods, apparatus, and system for expression of human breast milk

## Concepts

machine-extracted

 Download  Filter table

Name	Image	Sections	Count	Query match
human milk		title,claims,description	76	0.000
Breast		claims,abstract,description	176	0.000
Milk		claims,abstract,description	61	0.000
milk		claims,abstract,description	56	0.000
milk		claims,abstract,description	56	0.000
fluid		claims,description	156	0.000
measurement		claims,description	75	0.000
Milk, Human		claims,description	71	0.000
communication		claims,description	67	0.000
analytical method		claims,description	38	0.000
activating		claims,description	8	0.000
controlling effect		claims,description	7	0.000
displacement reaction		claims,description	6	0.000
absorption reaction		claims,description	4	0.000
Colostrum		claims,description	3	0.000
colostrum		claims,description	3	0.000
Show all concepts from the description section				

Data provided by IFI CLAIMS Patent Services



## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	17181057			
<b>Filing Date:</b>	22-Feb-2021			
<b>Title of Invention:</b>	BREAST PUMP SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE			
<b>Filer:</b>	Anupma Sahay/Renee Bennett			
<b>Attorney Docket Number:</b>	4944.0120006			
Filed as Small Entity				
<b>Filing Fees for Utility under 35 USC 111(a)</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	130	130
<b>Total in USD (\$)</b>				<b>130</b>

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	46632776
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	26111
<b>Filer:</b>	Anupma Sahay/Renee Bennett
<b>Filer Authorized By:</b>	Anupma Sahay
<b>Attorney Docket Number:</b>	4944.0120006
<b>Receipt Date:</b>	16-SEP-2022
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	16:47:49
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 130
RAM confirmation Number	E20229FG48081468
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	2022-09-16-IDS_Transmittal_4944-0120006.PDF	222882	no	1
			ca8762094b02f19f8b1610652a757453f74573dd		

**Warnings:****Information:**

2	Transmittal Letter	2022-09-16-IDS-Pleading-4944-0120006.pdf	103253	no	2
			eef2733232d207cc198e6e2607a9f40da811aeed		

**Warnings:****Information:**

3	Information Disclosure Statement (IDS) Form (SB08)	2022-09-16-IDS-SB08a-4944-0120006.pdf	171431	no	2
			e11f4562794d91d0166c7a52dc98a5716ddb021		

**Warnings:****Information:**

This is not an USPTO supplied IDS fillable form

4	Foreign Reference	FP1_JP2007501673A.PDF	1047933	no	56
			ded1cff23953f063a92ff6b940b429861238b620		

**Warnings:****Information:**

5	Foreign Reference	FP2_JP2014529312A.PDF	502800	no	28
			85aca051c5292465ee8a0d28fda804d31c2603d6		

**Warnings:****Information:**

6	Foreign Reference	FP3_JP2016514516A.PDF	568791	no	32
			5010bc4d9e8d89fbde11360d405db7b6a01ab5ff		

**Warnings:**

<b>Information:</b>					
7	Foreign Reference	FP4_JP2017509379A.PDF	1442845	no	73
			4361e48dfc0bfc140b4793248b976d2904431915		
<b>Warnings:</b>					
<b>Information:</b>					
8	Fee Worksheet (SB06)	fee-info.pdf	37817	no	2
			19fe2b8f34f4292f0b320c70487211c3a02e3d65		
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			4097752		
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p>					



Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	February 22, 2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	COURTNEY B FREDRICKSON
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s)  <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Copies of cited documents FP1-FP4.
<div>Remarks</div> <p>The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account No. 19-0036.</p> <p>Online Payment Authorization for \$130.00 to cover the IDS fee</p>		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Anupma Sahay #78,704/		
Printed name	Anupma Sahay		
Date	September 16, 2022	Reg. No.	78,704

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Form PTO/SB/08a or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed publication dates on the attached IDS Form based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Filing under 37 C.F.R. § 1.97(c). This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on

the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

The required fee is provided through online credit card payment authorization in the amount of **\$130.00** in payment of the fee under 37 C.F.R. § 1.17(p).

Copies of documents **FP1-FP4** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patent application publications cited as documents **US1-US3** on the attached IDS Form are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018 (now U.S. Patent No. 10,926,011) in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Anupma Sahay #78,704/

Anupma Sahay  
Attorney for Applicant  
Registration No. 78,704

Date: September 16, 2022

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690
26111	7590	10/26/2022		
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C. 1100 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			EXAMINER FREDRICKSON, COURTNEY B	
			ART UNIT	PAPER NUMBER
			3783	
			NOTIFICATION DATE	DELIVERY MODE
			10/26/2022	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

e-office@sternekessler.com

**Office Action Summary****Application No.**

17/181,057

**Applicant(s)**

O'TOOLE et al.

**Examiner**

COURTNEY FREDRICKSON

**Art Unit**

3783

**AIA (FITF) Status**

Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 27July2022.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.

2a) ☒ This action is **FINAL**.

2b) ☐ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims\***

5) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are pending in the application.

5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

6) ☐ Claim(s) \_\_\_\_ is/are allowed.

7) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are rejected.

8) ☐ Claim(s) \_\_\_\_ is/are objected to.

9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 22February2021 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a) ☒ All b) ☐ Some\*\* c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

3) ☐ Interview Summary (PTO-413)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)

Paper No(s)/Mail Date \_\_\_\_.

4) ☐ Other: \_\_\_\_.

Paper No(s)/Mail Date \_\_\_\_.

Application/Control Number: 17/181,057  
Art Unit: 3783

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## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Response to Amendment***

This office action is responsive to the amendment filed on July 12, 2022. As directed by the amendment: claims 1, 3-22, 24, 25, and 28-33 have been amended, claim 2 has been cancelled, and claim 34 has been added. Thus, claims 1, 3-22, 24, 25, and 28-34 are presently pending in this application.

### ***Response to Arguments***

Applicant's arguments, see pg. 8, filed July 12, 2022, with respect to the rejection(s) of claim(s) 1 under 35 U.S.C 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Applicant's amendments.

### ***Claim Objections***

**Claim 34** is objected to because of the following informalities: it is recommended to amend the claim in line 1 to recite "a length" to correct for grammar. Appropriate correction is required.

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***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating

obviousness or nonobviousness.

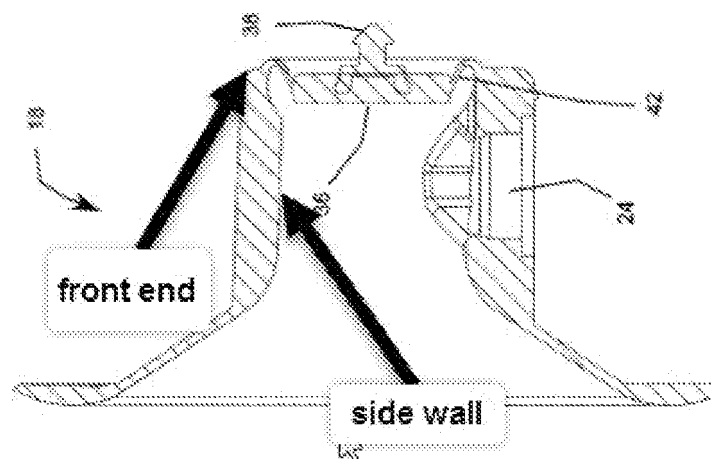
**Claims 1, 3, 6-8, 10, 11, 14, 16-18, 22, 24, 31, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers (US 20080275386) and in further view of Cook (EP 2502640).**

**Regarding claim 1**, Myers discloses a breast pump device comprising:

a self-contained, in-bra wearable device (breast pump 10 in fig. 1), comprising:

(i) a housing (outer housing 16 in fig. 1) comprising (a) a battery (AA battery 51 in fig. 10), and (b) a pump configured to generate negative air pressure (motor 54 in fig. 10);

(ii) a breast shield (breast cup 16 in fig. 1) being configured to slide in and out of the housing (paragraph 58 discloses that the cup “clicks” into place within the housing; paragraph 42 discloses the breast cup being removable), the breast shield comprising a breast flange (outer flange area 50 in fig. 5) and a nipple tunnel (nipple tunnel 46 in fig. 5) comprising a side wall and a front end (see below), in which the breast shield is transparent or optically clear (paragraph 65); and



(iii) a milk container that is configured to be attached to and removed from the housing (collection bag 28 is shown to be operatively attached to the housing and is physically engaged to the bottom portion of the housing).

However, Myers does not teach or disclose the breast shield being of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a

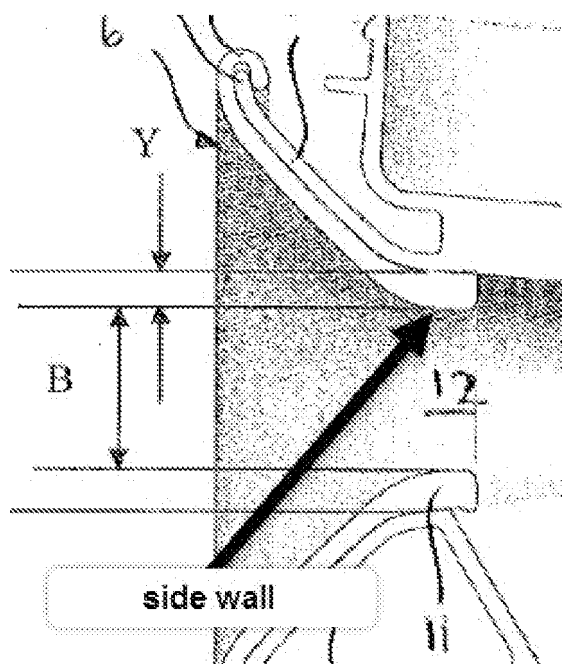


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nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a

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nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

**Regarding claim 3**, in the modified device of Myers, Myers discloses the breast shield is rigid (paragraph 47 discloses the nipple tunnel, which is part of the breast shield, is rigid).

**Regarding claim 6**, in the modified device of Myers, Myers discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Myers is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

**Regarding claim 7**, in the modified device of Myers, Myers discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 9A/B shows a singular inner surface which would extend from the nipple to the breast).

**Regarding claim 8**, in the modified device of Myers, Myers discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 5 shows a singular item).

**Regarding claim 10**, in the modified device of Myers, Myers discloses the breast shield is configured to slide into the housing with a single push action (paragraph 58 discloses the shield can click into place).

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Art Unit: 3783

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**Regarding claim 11**, in the modified device of Myers, Myers discloses the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump (flange top 36 in fig. 9A).

**Regarding claim 14**, in the modified device of Myers, Myers discloses milk container attaches to a lower part of the housing (fig. 1 shows a part of the collection bag attached to the bottom part of the housing 16) and forms a base of the breast pump device (fig. 1).

**Regarding claim 16**, in the modified device of Myers, Myers discloses the nipple tunnel includes guide lines running parallel along one or more sides of the nipple tunnel (detent tabs 52a/b in fig. 15 are shown to be extending in a parallel to the width direction of the nipple tunnel sides).

**Regarding claim 17**, in the modified device of Myers, Myers discloses the nipple tunnel includes an air hole or passage (24 in fig. 9A), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (paragraph 52).

**Regarding claim 18**, in the modified device of Myers, Myers discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (outlet 24 in fig. 9A).

**Regarding claim 22**, in the modified device of Myers, Myers discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 1; paragraph 40).

**Regarding claim 24**, in the modified device of Myers, Myers discloses the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg (paragraph 72).

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**Regarding claim 31**, modified Myers teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 34**, in the modified device of Myers, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 4 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers in view of Cook, as applied to claim 1 above, and further in view of Phillips (US 20160296682), as evidenced by Yuen (US 20050228342).**

**Regarding claim 4**, modified Myers teaches all of the claimed limitations set forth in claim 1, as discussed above. Myers further teaches the breast shield is made from plastic (paragraph 40 discloses the breast cup being made from silicone, which is a type of plastic, as evidenced by Yuen in paragraph 24). However, modified Myers does not teach or disclose breast shield is dishwasher safe.

Phillips teaches a breast pump device (fig. 1) comprising a breast shield (110 in fig. 1). Phillips further teaches that the shield can be washed in a dishwasher (paragraph 60). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Myers to be dishwasher safe for the purpose of enabling the shield to be cleaned in the dishwasher for reuse, as taught by Phillips (paragraph 60).

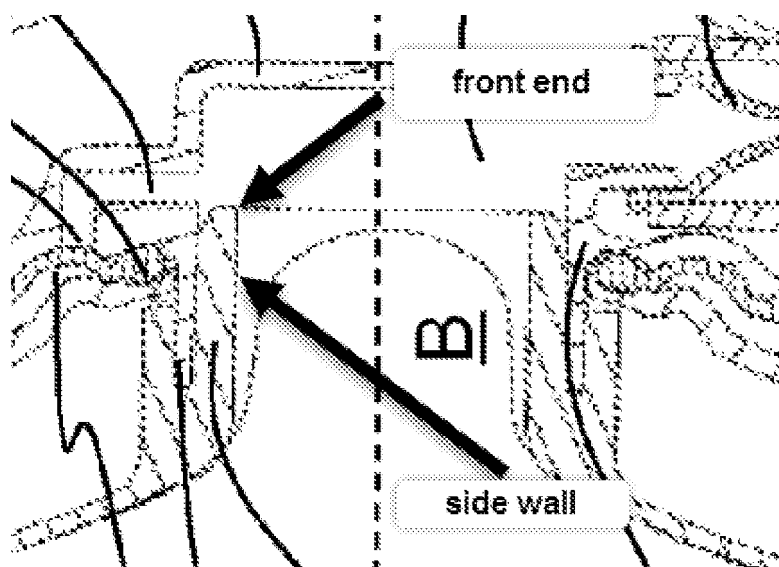
**Claims 1, 6-10, 14, 17, 18, 20-22, 31, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil (US 20130023821) in view of Myers (US 20080275386) and in further view of Cook.**

**Regarding claim 1**, Khalil discloses a breast pump device comprising:

a self-contained, in-bra wearable device (figs. 9-11), comprising:

(i) a housing (6' and 6" form a housing as shown in fig. 9) that includes (a) a power source (paragraph 32 discloses the power source integrated into the housing), and (b) a pump generating negative air pressure (vacuum pump 81 in fig. 10);

(ii) a breast shield (breast interface 1 in fig. 11) being configured to slide in and out of the housing (breast interface 1 is configured to slide in/out from the housing by attaching/detaching the lip 11 to the flange 62 of the housing as shown in fig. 4), the breast shield made up of a breast flange (base part 12 in fig. 4) and a nipple tunnel (stub 10 in fig. 4) comprising a side wall and a front end (see below); and



(iii) a milk container that is configured to be attached to and removed from the housing (milk collection container 7' in fig. 11; paragraph 69 discloses the container being releasably connected to the housing part 6').

However, Khalil does not teach or disclose the power source being a battery and the breast shield being transparent or optically clear and being of a plurality of

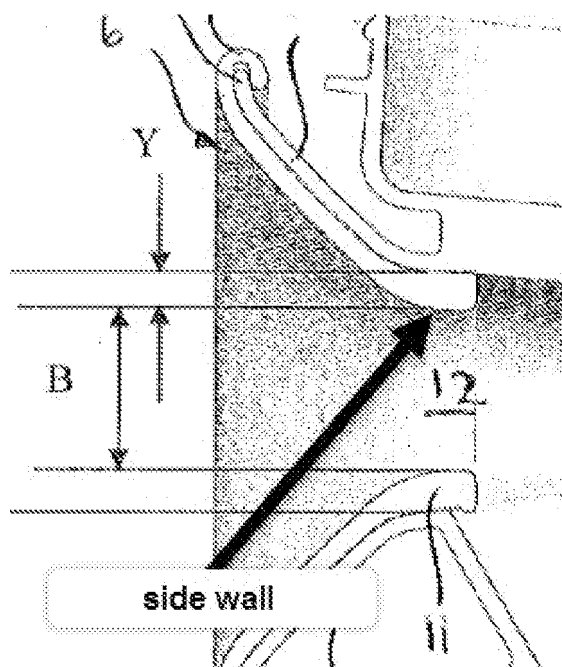
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interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Myers teaches a similar breast pump system (fig. 1) having a housing (outer housing 16 in fig. 1) which comprises a battery (battery 52 in fig. 10) and a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device and to have made the breast shield transparent to enable a user to view the condition of a nipple (paragraph 65).

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

**Regarding claim 6**, in the modified device of Khalil, Khalil discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Khalil is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

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**Regarding claim 7**, in the modified device of Khalil, Khalil discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 11).

**Regarding claim 8**, in the modified device of Khalil, Khalil discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 11).

**Regarding claim 9**, in the modified device of Khalil, Khalil discloses the breast shield is generally symmetrical about a centre-line running from a top to a bottom of the breast shield when positioned upright for normal use (fig. 11).

**Regarding claim 10**, in the modified device of Khalil, Khalil discloses the breast shield is configured to slide into the housing with a single push action (the shield of Khalil is functionally capable of being pushed into the housing so that the nipple tunnel is located in the housing).

**Regarding claim 14**, in the modified device of Khalil, Khalil discloses milk container attaches to a lower part of the housing and forms a base of the breast pump device (fig. 9).

**Regarding claim 17**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes an air hole or passage (opening 13 in fig. 3), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (figs. 4 and 5).

**Regarding claim 18**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (opening 13 in fig. 3 is considered to be on a “lower” surface of the nipple tunnel since “lower” is not further defined; see fig. 5).



**Regarding claim 22**, in the modified device of Khalil, Khalil discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 9).

**Regarding claim 31**, modified Khalil teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 34**, in the modified device of Khalil, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 5 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Chang (US 20180333523).**

**Regarding claim 5**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast shield is configured to attach using magnets to the housing.

Chang teaches a substantially similar self-contained breast pump system (breast pump system 10 in fig. 1A) having a breast shield (flange 14 in fig. 1A) attached to a housing (housing 12 in fig. 1A) and configured to attach to the housing using one or more magnets (paragraph 108 discloses the shield uses magnets 118 attached to the shield to determine if the shield is properly attached to the housing). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Khalil to be configured to attach using magnets to the housing since Chang teaches this configuration provides a safeguard

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such that the system will not operate unless all components are fully connected (paragraph 108).

**Claims 12 and 13 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Phillips (US 20160296682).**

**Regarding claim 12**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Although it appears based on fig. 11 of Khalil that the container would be rigid, modified Khalil does not explicitly teach or disclose this limitation.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is substantially rigid (paragraph 57 discloses the container being made from Tritan; pg. 21 of Applicant's specification discloses that Tritan is a polycarbonate material, which is a known rigid material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Regarding claim 13**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further discloses the milk container is an optically clear, plastic container (paragraph 69 discloses the container is made of plastic like cover 6" and is transparent in its entirety). However, Khalil does not explicitly teach or disclose the milk container is dishwasher safe.

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Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is dishwasher safe (paragraph 57 discloses the container being made from Tritan; pg. 21, lines 13-18 of Applicant's specification discloses that Tritan a dishwasher safe material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Claim 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Karsan (US 20070228059).**

**Regarding claim 15**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the milk container is configured to magnetically attach to the housing.

Khalil teaches that the milk container latches to the housing by a locking lug (paragraph 69 discloses a locking lug formed on the container latches engages into a corresponding recess). Karsan teaches a container (1 in fig. 1) having a case (2 in fig. 3) and a base (fig. 3) which are releasably held together (paragraph 51 discloses the connection being releasable) via a latch mechanism (5 and 6 in fig. 3). Karsan further teaches that the latching mechanism is embodied as a lug and recess (5 and 6, respectively in fig. 3; paragraph 65) but may alternatively be embodied as a magnetic means so that the two components may be magnetically latched (paragraph 65).

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In Applicant's invention, Applicant uses the magnets to removably secure the milk container to the housing. Thus, Karsan is reasonably pertinent to the problem faced by the inventor since Karsan teaches using magnets as a removable latching connection between two components. As Karsan teaches that the magnetic means (paragraph 65) are functional equivalents to a locking lug and recess (paragraph 65), it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have substituted the locking lug/recess configuration of Khalil with the magnetic means, as taught by Karsan. The substitution would have resulted in providing an equivalent secure attachment of the milk container to the housing.

**Claim 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Blondheim (US 20120277636).**

**Regarding claim 19**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump comprises one or more piezo air pumps.

Blondheim is directed towards a breast pump device (fig. 1) which comprises an air pump (66 in fig. 6). Blondheim further teaches that the air pump can be a piezoelectric pump (paragraph 36). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the pump of modified Khalil to be a piezoelectric pump, as taught by Blondheim for the purpose of rendering the pump small in size (paragraph 36).

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**Claims 20 and 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Barak (US 20140378895).**

**Regarding claim 20**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing further includes a Universal Serial Bus (USB) charging socket.

Barack is directed towards a breast pump device (fig. 1) which comprises a housing which houses a pump (fig. 1 shows a pump 20 which would necessarily have some sort of housing since it is disclosed to have a USB port and a user interface). Barack further teaches a USB charging socket (USB port 34 in fig. 1; paragraph 45). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include the USB charging socket, as taught by Khalil, for the purpose of enabling the device to interface with an external memory (paragraph 45).

**Regarding claim 21**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing includes a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast.

Barack teaches a breast pump device (fig. 1) which has a control electronics (controller 22 in fig. 1) and a control interface (user interface 30 in fig. 1) that is user selectable to indicate or record if milk is being expressed from the left or right breast

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(paragraph 43) and that, when selected for a particular pumping session, sends data to a connected application, running on a device, such as a smartphone, that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast (paragraph 46 discloses transmitting via transceiver the parameters that have been entered at the user interface 30 to a remote device; paragraph 43 discloses that one parameter entered at the user interface is which breast is selected).

Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast, as taught by Barack. This modification would enable a user to track which parameters are best suited for each breast to optimize pumping, as taught by Barack (paragraphs 8 and 43).

**Claim 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Guthrie (US 20160220743).**

**Regarding claim 25**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device includes a sensor that is configured to directly measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.

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Guthrie is directed towards a breast pump device comprising a sensor (detector 607 in fig. 6B) that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container (paragraph 63 discloses that the emitter 606 and the detector 607 operate to detect light reflecting off the opaque surface of the milk). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device to include a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container, as taught by Guthrie, for the purpose of measuring volume of milk pumped (paragraph 54).

**Claim 29 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, and further in view of Mendoza (US 6227936).**

**Regarding claim 29**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump is a lightweight air pump that enables the total mass of the breast pump system, unfilled with milk, to be less than 250gm.

Mendoza teaches a bra which is designed to support a breast pump to allow the mother's hands to remain free (1:8-12). Mendoza further discloses that the bra must be able to support up to 8 ounces when the pump is full (1:58-62). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed

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invention to have modified the system of modified Khalil to be a lightweight air pump that enables the total weight of the system, unfilled with milk, to be less than 250gm, as taught by Mendoza since Mendoza teaches that a lightweight system is crucial for enabling the system to be supported by a bra.

**Claim 30 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, in further view of Baker (US 20090281485).**

**Regarding claim 30**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

Baker is directed towards a device for removing fluid from a body (fig. 6) using a vacuum pump embodied as a motor (motor 9 in fig. 6; paragraph 243). Baker further teaches that the device makes less than 20 decibel of noise at full power (paragraph 121) by sound proofing the walls of the housing and by adding a counter balance to the motor (paragraph 144). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device of modified Khalil to have the device make less than 20 dB of noise during maximum power for the purpose of making the device for discrete and comfortable for the user and others around the user.

**Claim 32 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 31 above, in further view of Cudworth (US 20120165729).**



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**Regarding claim 32**, modified Khalil teaches all of the claimed limitations set forth in claim 31, as discussed above, but does not teach or disclose each of the plurality of interchangeable breast shields includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.

Cudworth teaches a breast pump system (fig. 1) having a shield (attachment 1) having a flange (cup 2 in fig. 2) and a nipple tunnel (cylindrical portion 3 in fig. 1). Cudworth further teaches the nipple tunnel includes fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (grooves 12 in fig. 1 are functionally capable of serving as “fit lines” to assist a user in determining if the breast shield is correctly sized and since the claimed fit lines are not further structurally defined). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of Khalil to include the claimed fit lines, as taught by Cudworth, for the purpose of providing a massaging pressure on the breast to help stimulate milk production (paragraph 30).

**Claim 33 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers and in further view of Cook, as applied to claim 1 above, in further view of Meyers (US 5542921).**

**Regarding claim 33**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further teaches control electronics (“control

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elements and a display” in paragraph 51) which would be powered by the battery (the power source of Khalil is understood to power the device).

However, Khalil does not teach or disclose the battery to be rechargeable and the housing further including a power charging circuit for controlling the charging of the rechargeable battery.

Meyers is directed to a breast pump device (fig. 1) comprising a battery configured to be recharged (9:50-52 discloses recharging the batteries) and a power charging circuit for controlling the charging of the rechargeable battery (“circuit” in 9:50-52). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the battery of modified Khalil to be rechargeable and to have incorporated a power charging circuit for controlling the charging of the rechargeable battery, as taught by Meyers to enable the batteries to be reused.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed.

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Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit [www.uspto.gov/patent/patents-forms](http://www.uspto.gov/patent/patents-forms). The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to [www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp](http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp).

**Claims 1, 3-22, 24, 25, 29-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of U.S. Patent No. 10881766 in view of Myers, Cook, and the teachings below (see table).**

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**Regarding claim 1**, claim 1 of the issued patent claims all of the limitations in instant claim 1 except claim 1 does not claim a self-contained device, the housing having a battery, the breast shield having a breast flange and nipple tunnel and being optically clear or transparent and being a part of a plurality of breast shields, wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Khalil teaches a breast pump device (fig. 10) configured as a self-contained, in-bra wearable device (fig. 10; paragraph 70) having a breast shield (1 in fig. 11) having a flange (12 in fig. 6) and a nipple tunnel (13 in fig. 6) and a milk container (7' in fig. 11) configured to be attached and removed from the housing (paragraph 69). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the reference claim to be a self-contained, in-bra wearable device having a breast shield with a flange and nipple tunnel and a milk container configured to be attached and removed from the housing, as taught by Khalil, for the purpose of enabling the device to be a small and hands-free (paragraph 70). The modification of the breast shield would enable the shield to interface with the breast and receive the nipple and the modification of the milk container would enable the milk to be collected after expression.

Myers teaches a self-contained, in bra breast pump (fig. 1) which comprises a breast shield (18 in fig. 2) having a flange (48 in fig. 5) and nipple tunnel (46 in fig. 5) and a housing (16 in fig. 2) for housing a pump (56 in fig. 10) and a battery for powering the pump (52 in fig. 10). Myers further teaches that the breast shield is optically clear

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(paragraph 65). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield to be optically clear for the purpose of allowing a user to visualize the placement of the breast and nipple and to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

App Claim	Ref Claim	Teaching
1	1	see discussion above

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3	Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5	Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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19		Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Cudworth teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, and 28-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of U.S. Patent No. 10926011 in view of Khalil, Myers, and Cook, and the teachings below (see table).**

**Regarding claim 1**, claim 1 of the issued patent claims all of the limitations in instant claim 1 except claim 1 does not claim a self-contained device, the housing

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having a battery, the breast shield having a breast flange and nipple tunnel and being optically clear or transparent and being a part of a plurality of breast shields, wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Khalil teaches a breast pump device (fig. 10) configured as a self-contained, in-bra wearable device (fig. 10; paragraph 70) having a breast shield (1 in fig. 11) having a flange (12 in fig. 6) and a nipple tunnel (13 in fig. 6) and a milk container (7' in fig. 11) configured to be attached and removed from the housing (paragraph 69). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the reference claim to be a self-contained, in-bra wearable device having a breast shield with a flange and nipple tunnel and a milk container configured to be attached and removed from the housing, as taught by Khalil, for the purpose of enabling the device to be a small and hands-free (paragraph 70). The modification of the breast shield would enable the shield to interface with the breast and receive the nipple and the modification of the milk container would enable the milk to be collected after expression.

Myers teaches a self-contained, in bra breast pump (fig. 1) which comprises a breast shield (18 in fig. 2) having a flange (48 in fig. 5) and nipple tunnel (46 in fig. 5) and a housing (16 in fig. 2) for housing a pump (56 in fig. 10) and a battery for powering the pump (52 in fig. 10). Myers further teaches that the breast shield is optically clear (paragraph 65). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield to be



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optically clear for the purpose of allowing a user to visualize the placement of the breast and nipple and to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.

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4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9		Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15		Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16		It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
17		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19		Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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20		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
28	9	
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Cudworth teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 29-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the issued patents below in view of Myers, Cook and the teachings below (see table).**

- 17203050 (US Patent 11357893)

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- **17203079 (US Patent 11376352)**
- **17203216 (US Patent 11357894)**
- **17203259 (US Patent 11324866)**
- **17203327 (US Patent 11413380)**

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple

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tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9		Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.

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10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25	Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
29	Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30	Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32	Cudworth teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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33	Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34	Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 28-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following US Patents in view of Myers, Cook and the teachings below (see table).**

- 17203109 (US Patent 11260151)
- 17203313 (US Patent 11311654)

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

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Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.



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6	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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22		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
28	18 ('151 patent), 13 ('654 patent)	
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Cudworth teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 29-34 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following copending applications in view Myers, Cook and the teachings below.**

- 17203150
- 17203179
- 17203292
- 17203355

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- **17203384**
- **17203397**
- **17203418**

Claim 1 of the reference claim claims all of the features claimed in reference claim 1 except in that claim 1 of the reference claim does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of

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interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9		Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25	Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
29	Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30	Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32	Cudworth teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33	Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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34	Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.
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### ***Allowable Subject Matter***

Except for the double patenting rejections above, **claim 28** would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not teach or suggest the pump delivers the claimed stall pressure and free air flow.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to COURTNEY FREDRICKSON whose telephone number is (571)270-7481. The examiner can normally be reached Monday-Friday (9 AM - 5 PM EST).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NATHAN PRICE can be reached on 571-270-5421. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/COURTNEY B FREDRICKSON/  
Examiner, Art Unit 3783

/NATHAN R PRICE/  
Supervisory Patent Examiner, Art  
Unit 3783

<b><i>Notice of References Cited</i></b>	Application/Control No. 17/181,057	Applicant(s)/Patent Under Reexamination O'TOOLE et al.	
	Examiner COURTNEY FREDRICKSON	Art Unit 3783	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A					
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

**FOREIGN PATENT DOCUMENTS**


*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	EP-2502640-A1	09-2012	EP	COOK G	A61M1/06
	O					
	P					
	Q					
	R					
	S					
	T					

**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	


\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



<b><i>Index of Claims</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

CLAIMS										
<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	01/12/2022	10/17/2022							
	1	✓	✓							
	2	✓	-							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
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	24	✓	✓							
	25	✓	✓							
	26	-	-							
	27	-	-							
	28	✓	✓							
	29	✓	✓							
	30	✓	✓							
	31	✓	✓							
	32	✓	✓							
	33	✓	✓							
	34		✓							

<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC - Searched*		
Symbol	Date	Examiner
a61m1/06-069	01/12/2022	cbf

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see SEARCH history	01/12/2022	cbf
searched inventors in PALM and SEARCH	01/12/2022	cbf
consulted child search history	01/12/2022	cbf
Updated search history	10/17/2022	cbf

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/COURTNEY B FREDRICKSON/ Examiner, Art Unit 3783	
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EP 2 502 640 A1



## EUROPEAN SEARCH REPORT

Application Number  
EP 11 15 8960

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 857 051 A (LARSSON KARL O A H [CH]) 15 August 1989 (1989-08-15) * column 3, lines 48-65 * * column 7, lines 16-62 * * figure 2 *	1-12	INV. A61M1/06
X	US 4 323 067 A (ADAMS FRANK H) 6 April 1982 (1982-04-06) * column 4, line 15 - column 5, line 2 * * figures 1, 2 *	1-12	
X	GB 2 392 626 A (UNIV SCHOOL NIHON JURIDIC PER [JP]) 10 March 2004 (2004-03-10) * page 6, line 16 - page 9, line 3 * * figures 1, 2 *	1-12	
X	US 4 573 969 A (SCHLENSOG KLAUS [CH] ET AL) 4 March 1986 (1986-03-04) * column 5, lines 20-28 * * column 8, lines 10-64 * * figures 1, 2 *	1-12	
A	US 5 049 126 A (LARSSON KARL O A H [CH]) 17 September 1991 (1991-09-17) * column 2, lines 31-42; figure 1 *	1,7,8	TECHNICAL FIELDS SEARCHED (IPC) A61M
<del>The present search report has been drawn up for all claims</del>			
Place of search The Hague		Date of completion of the search 24 August 2011	Examiner Schlaug, Martin
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P/4C31)

EP 2 502 640 A1



Application Number

EP 11 15 8960

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:
- 1-12
- ☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 11 15 8960

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-12

A breast pump comprising an insert (claim 1-6), an insert (claim 7) and an insert kit (claim 8-12)  
and further features relating to  
the insert being interchangeable  
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2. claims: 13-15

A breast pump comprising a funnel (claim 13, 15) or an insert (claim 14, 15)  
and further features relating to  
a textured surface finish  
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 15 8960

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-08-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4857051	A	15-08-1989	NONE
US 4323067	A	06-04-1982	NONE
GB 2392626	A	10-03-2004	CN 1509191 A 30-06-2004 GB 2392626 A 10-03-2004 JP 2002336347 A 26-11-2002 US 2004133151 A1 08-07-2004 WO 02094345 A1 28-11-2002
US 4573969	A	04-03-1986	CA 1218276 A1 24-02-1987 DE 3364783 D1 28-08-1986 EP 0116186 A1 22-08-1984 US 4573969 A 04-03-1986
US 5049126	A	17-09-1991	NONE

EPO FORM P0489

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B. FREDRICKSON
Sheet	1	of	4	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	001	US-D788293-S	05-30-2017	ECKSTEIN et al.	
	002	US-D809646-S	02-06-2018	MASON et al.	
	003	US-D832995-S	11-06-2018	MASON et al.	
	004	US-D888225-S	06-23-2020	ASKEM et al.	
	005	US-7641629-B2	01-05-2010	YUEN; Yat Keung William	
	006	US-10398816-B2	09-03-2019	CHANG et al.	
	007	US-10625005-B2	04-21-2020	CHANG et al.	
	008	US-20040127845-A1	07-01-2004	RENZ; Charles J. et al.	
	009	US-20070219486-A1	09-20-2007	MYERS; Kenneth E. et al.	
	010	US-20120021068-A1	01-26-2012	BARNESS; Itzhak et al.	
	011	US-20120035951-A1	02-09-2012	GOETZ; Steven M. et al.	
	012	US-20120043065-A1	02-23-2012	RANNE; Pasi et al.	
	013	US-20120072117-A1	03-22-2012	LODDOCH; Alexander et al.	
	014	US-20120072118-A1	03-22-2012	MANN; Tobias	
	015	US-20120095599-A1	04-19-2012	PAK; H. Ali et al.	
	016	US-20120143879-A1	06-07-2012	STOITSEV; Todor	
	017	US-20120220753-A1	08-30-2012	GERA; Lajos et al.	
	018	US-20150212036-A1	07-30-2015	JIN; Jian et al.	
	019	US-20150212037-A1	07-30-2015	OKAZAKI; Satoshi et al.	
	020	US-20170216505-A1	08-03-2017	KIM; Sang Ha	
	021	US-20180361040-A1	12-20-2018	O'TOOLE; Jonathan et al.	
	022	US-20210030934-A1	02-04-2021	ZHANG; Shu Ting	

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				<b>Complete if Known</b>	
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				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B. FREDRICKSON
Sheet	2	of	4	Attorney Docket Number	4944.0120006

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known)				
	001	WO-2016010524-A1	01-21-2016	HEWLETT PACKARD DEVELOPMENT CO [US]		<input type="checkbox"/>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)		Complete if Known			
		Application Number	17/181,057		
		Filing Date	02-22-2021		
		First Named Inventor	O'TOOLE; Jonathan		
		Art Unit	3783		
		Examiner Name	COURTNEY B. FREDRICKSON		
Sheet	3	of	4	Attorney Docket Number	4944.0120006

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T <sup>2</sup>
	001	4MD Medical, "Assembling Spetra Breast Pump Parts," YouTube [online], dated November13, 2016, URL: <a href="http://www.youtube.com/watch?v=ChV8xQfcBxU">http://www.youtube.com/watch?v=ChV8xQfcBxU</a> .	<input type="checkbox"/>
	002	The Best Hands-Free Breast Pumps, posted at healthline.com, earliest date posted on 08/24/2020, [online], acquired on 10/30/2021, Available on internet. url: <a href="https://www.healthline.com/health/parenting/breast-feeding/best-hands-free-breast-pumps#Best-hands-free-breast-pumps">https://www.healthline.com/health/parenting/breast-feeding/best-hands-free-breast-pumps#Best-hands-free-breast-pumps</a> (Year: 2020).	<input type="checkbox"/>

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	10/17/2022
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO		Complete if Known	
		Application Number	17/181,057
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)		Filing Date	02-22-2021
		First Named Inventor	O'TOOLE; Jonathan
		Art Unit	3783
		Examiner Name	COURTNEY B. FREDRICKSON
		Attorney Docket Number	4944.0120006
Sheet	4	of	4

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☐ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Anupma Sahay #78,704/	Date (YYYY-MM-DD)	2022-07-12
Name/Print	Anupma Sahay	Registration Number	78,704

## PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	17/181057.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:05 PM
L2	128	((("O'TOOLE") near3 ("Jonathan")) OR ("ROLLO") near3 ("Adam")) OR ("CARR") near3 ("Andrew"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/12/31 01:05 PM
L3	8470	a61m1/06-069.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
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L6	8	("20130023821" "20070219486" "20160296682").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:14 PM
L7	2	("20140378895").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:16 PM
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L9	126	("10881766" OR "10926011" OR "20040087898" OR "20090281482" OR "20100292636" OR "20120165729" OR "20140263611" OR "20160228625" OR "20180110900" OR "20210196873" OR "20210196874" OR "20210196875" OR "20210196876" OR "20210205511" OR "20210205512" OR "20210205513" OR "20210205514" OR "20210205515" OR "20210205516" OR "20210205517" OR "20210205518" OR "20210228789" OR "20210268158" OR "7666162" OR "8608685" OR "20070135761" OR "20070179439" OR "20090281485" OR "20110009824" OR "20160271305" OR "20160296682" OR "20160325031" OR "20170095599" OR "20170112983" OR "20180028733" OR "20180333523" OR "5542921" OR "7833190" OR "10039871" OR "20020193731" OR "20040056641" OR "20040074281" OR "20040267215" OR "20050219302" OR "20060122575" OR "20070051172" OR "20070051727" OR "20080177224" OR "20080262420" OR "20080275386" OR "20110004154" OR "20110196291" OR "20110274566" OR "20120277636" OR "20130023821" OR	SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2022/01/12 05:14 PM
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		"20140031744" OR "20140052056" OR "20140275857" OR "20140323962" OR "20140378895" OR "20150217036" OR "20150217037" OR "20150283311" OR "20160000980" OR "20160058928" OR "20160058929" OR "20160082165" OR "20160082166" OR "20160151551" OR "20160158424" OR "20160166745" OR "20160206794" OR "20160220743" OR "20160220745" OR "20160256617" OR "20160287767" OR "20160296681" OR "20160310650" OR "20170021068" OR "20170035951" OR "20170043065" OR "20170072117" OR "20170072118" OR "20170143879" OR "20170220753" OR "20180021490" OR "20180110906" OR "2849881" OR "4390024" OR "4535627" OR "5474683" OR "5941847" OR "5973770" OR "6045529" OR "6090065" OR "6227936" OR "6328709" OR "6358226" OR "6383163" OR "6440100" OR "6461324" OR "6547756" OR "6579258" OR "6663587" OR "6749582" OR "7048519" OR "7201735" OR "7312554" OR "7314400" OR "7662018" OR "7776008" OR "8057425" OR "8118772" OR					
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L10	45	"8187227" OR "8262606" OR "8282596" OR "8376986" OR "8702646" OR "8801495" OR "8876760" OR "8926556" OR "9033913" OR "9173587" OR "9345274" OR "9539377" OR "D548831").pn. 9 AND (transparent)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/12 06:05 PM
L11	105	3 AND (batter\$4) AND ((interface flange shield cup) WITH (clear transparent))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/13 02:07 PM
L12	382	3 AND (silicone WITH plastic)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 10:40 AM
L13	2	("20180333523").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 11:50 AM
L14	43	3 AND ((USB "universal service bus") WITH (charg\$4 recharg\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:19 PM
L15	2	("20160220743").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD,	OR	ON	ON	2022/01/14 12:42 PM

L16	5	("5542921").pn.	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:52 PM
L20	256	3 AND ((shield cup interface flange) WITH (siz\$4) WITH different)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:23 PM
L21	2	("20120165729").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:31 PM
L22	2	("10881766").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:23 PM
L23	2	("10926011").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:38 PM
L24	12	("20080275386" "20140378895" "20130023821" "20180333523" "20160296682" "20070228059" "20120277636" "20160220743" "6227936" "20090281485" "20120165729"	(US-PGPUB; USPAT)	OR	ON	ON	2022/01/14 03:55 PM

L25	267	"5542921").pn. 3 AND (nipple WITH (chang\$4 differ\$4 adjust\$4 dissimilar\$4) WITH (size width))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/17 03:06 PM
L26	2	"44148977".fmid.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; JPO)	OR	ON	ON	2022/10/17 03:31 PM

**PE2E SEARCH - Search History (Interference)**

There are no Interference searches to show.



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	of	2	Attorney Docket Number	4944.0120006

## U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	US1	2014/0288466 A1	09-25-2014	Alvarez et al.	
	US2	2017/0173233 A1	06-22-2017	Tanaka	
	US3	2017/0292509 A1	10-12-2017	Kurihara et al.	

## FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> -Number <sup>4</sup> - Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
	FP1	JP 2007501673 A	02-01-2007	PLAYTEX PRODUCTS INC		X
	FP2	JP 2014529312 A	11-06-2014	MEDELA HOLDING AG		X
	FP3	JP 2016514516 A	05-23-2016	NAIA HEALTH INC		X
	FP4	JP 2017509379 A	04-06-2017	NAIA HEALTH INC		X

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	10/17/2022
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
				Attorney Docket Number	4944.0120006
Sheet	2	of	2		

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.

- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

- ☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Anupma Sahay #78,704/	Date (YYYY-MM-DD)	2022-09-16
Name/Print	Anupma Sahay	Registration Number	78,704

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	494	4	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	US1	2012/0109083 A1	05-03-2012	Coulthard et al.	
	US2	2016/0135998 A1	05-19-2016	Riesinger	
	US3	2014/0142501 A1	05-22-2014	Clark et al.	
	US4	2018/0104396 A1	04-19-2018	Park	
	US5	10,864,306 B2	12-15-2020	Fujisaki	
	US6	5,406,063 A	04-11-1995	Jelen	
	US7	2005/0245860 A1	11-03-2005	Britto et al.	
	US8	2007/0236584 A1	10-11-2007	Frost-Ruebling et al.	
	US9	2018/0008758 A1	01-11-2018	Garbez et al.	
	US10	2008/0299517 A1	12-04-2008	Delaney, II	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP1	JP 2013-545519 A	12-26-2013	KCI Licensing, Inc.		X
	FP2	JP 2016-524490 A	08-18-2016	BSN Medical GmbH		X
	FP3	WO 2013/064852 A1	05-10-2013	Smith & Nephew PLC		
	FP4	JP 2014-532498 A	12-08-2014	Smith & Nephew PLC		X
	FP5	WO 2016/006458 A1	01-14-2016	Murata Manufacturing Co., Ltd.		X
	FP6	JP H 11-178917 A	07-06-1999	Hirose Electric Co., Ltd.		X
	FP7	JP 2000-350527 A	12-19-2000	Pigeon Corp.		X
	FP8	WO 2016/007561 A1	01-14-2016	Naya Health Inc.		
	FP9	WO 2016/025405 A1	02-18-2016	Barral et al.		
	FP10	WO 2004/108184 A2	12-16-2004	Playtex Products, Inc.		
	FP11	JP 2016-526396 A	09-05-2016	Koninklijke Philips NV		X

Examiner Signature	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	2	494	4	Attorney Docket Number	4944.0120006

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP12	WO 2014/160614 A1	10-02-2014	Naia Health, Inc.		
	FP13	JP 2017-503552 A	02-02-2017	Nestec SA		X

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
				Attorney Docket Number	4944.0120006
Sheet	3	494	4		

NON-PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.		T <sup>2</sup>
	NPL1	International Search Report issued in International Application No. PCT/GB2021/050764, mailed July 6, 2021, 5 pages.		<input type="checkbox"/>
	NPL2	Japanese Search Report issued in Japanese Application No. 2020-519188, mailed June 24, 2022, 20 pages.		<input type="checkbox"/>
	NPL3	Extended European Search Report issued in European Application No. 22174446.9, mailed October 11, 2022; 26 pages.		<input type="checkbox"/>

Substitute for form 1449/PTO

# SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	COURTNEY B FREDRICKSON
Attorney Docket Number	4944.0120006

Sheet	4	494	4
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.

- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Richard D. Collier III/	Date (YYYY-MM-DD)	2023-01-26
Name/Print	Richard D. Collier III	Registration Number	60,390

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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**REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL  
(Submitted Only via EFS-Web)**

Application Number	17/181,057	Filing Date	2021-02-22	Docket Number (if applicable)	4944.0120006	Art Unit	3783
First Named Inventor	Jonathan O'TOOLE			Examiner Name	FREDRICKSON, Courtney B.		

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.**  
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

**SUBMISSION REQUIRED UNDER 37 CFR 1.114**

**Note:** If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on \_\_\_\_\_

☐ Other \_\_\_\_\_

☒ Enclosed

☒ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other \_\_\_\_\_

**MISCELLANEOUS**

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months \_\_\_\_\_  
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other \_\_\_\_\_

**FEES**

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**  
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to  
Deposit Account No 190036

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED**

☒ Patent Practitioner Signature  
Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature	Richard D. Collier III/	Date (YYYY-MM-DD)	2023-01-26
Name	Richard D. Collier III	Registration Number	60390

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is in the public interest (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*



## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/031510

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61M 1/06 (2014.01)

USPC - 604/74

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A41C 3/04; A61J 9/00, 11/00; A61M 1/06 (2014.01)

USPC - 215/11.1; 450/36, 37; 606/73, 74

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
CPC - A61M 1/06, 1/062, 1/064, 1/066 (2014.07)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/0316493 A1 (SCHLIENGER et al) 13 December 2012 (13.12.2012) entire document	1, 2, 4, 5, 7-11, 15-17, 19, 20, 26-28, 31-36, 41, 47, 48, 53, 55
Y		3, 6, 12-14, 18, 21-25, 29, 30, 37-40, 42-46, 49-52, 54
Y	WO 2012/014135 A1 (BOSMAN et al) 02 February 2012 (02.02.2012) entire document	3, 37
Y	US 2003/0153869 A1 (YTTEBORG) 14 August 2003 (14.08.2003) entire document	6
Y	US 2006/0106334 A1 (JORDAN et al) 18 May 2006 (18.05.2006) entire document	12-14, 38, 39
Y	US 5,007,899 A (LARSSON) 16 April 1991 (16.04.1991) entire document	18, 40
Y	US 2003/0191433 A1 (PRENTISS) 09 October 2003 (09.10.2003) entire document	21
Y	US 6,997,897 B1 (SILVER et al) 14 February 2006 (15.02.2006) entire document	22-24, 50-52
Y	US 2008/0039741 A1 (SHEMESH et al) 14 February 2008 (14.02.2008) entire document	25, 29, 30, 42-46, 49
Y	US 2012/004603 A1 (HARARI et al) 05 January 2012 (05.01.2012) entire document	45
Y	US 2012/0325219 A1 (SMITH) 27 December 2012 (27.12.2012) entire document	54

☐ Further documents are listed in the continuation of Box C.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

13 August 2014

Date of mailing of the international search report

02 SEP 2014

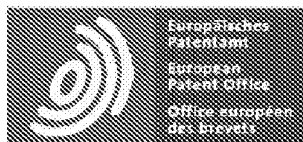
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PCT OSP: 571-272-7774



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## ABSTRACT JP2017503552A

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<sup>13</sup> The beverage preparation machine (1) is formed from illuminable parts (11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X) and inner parts (110, 120) and a control device (100, 105) for enabling and disabling illumination of the illuminable portion. and a user interface (10, 10', 20, 30, 40, 50). The controller may select a setting that activates only portions of the illuminable portion, e.g., sequentially activates successive portions in a rotational sequence around an inner portion, and optionally activates all portions after all portions. It has at least one setting for disabling simultaneously or for sequentially disabling previously enabled portions at the same speed as the speed of enabling or slower. [Selection drawing] Fig. 1a

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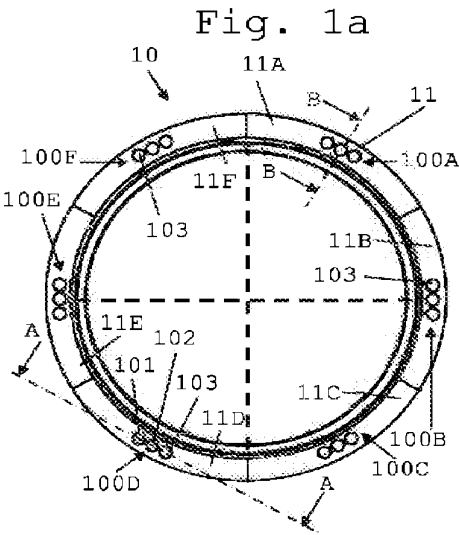
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(54) 【発明の名称】 飲料マシンのための、単純な人間工学的ユーザインタフェース

(57) 【要約】

飲料調製マシン (1) は、照明可能な部分 (11A ~ 11F、11A' ~ 11H'、21A ~ 21G、31A ~ 31F、41A ~ 41B、51A ~ 51H、51X) から形成され、内側部分 (110、120) の周囲で延びる、概ね外周の照明可能装置 (11、11'、21、31、41、51) と、照明可能部分の照明を有効化及び無効化するための制御装置 (100、105) とを有する、ユーザインタフェース (10、10'、20、30、40、50) を含む。制御装置は、照明可能部分の部分のみを有効化する設定、例えば、連続する部分を、内側部分を中心として回転シーケンスで順次有効化し、任意により、全ての部分を有効化した後に全ての部分を同時に無効化するか、又は先に有効化した部分を、有効化速度と同じ速度、若しくはより遅い速度で順次無効化するための、少なくとも1つの設定を有する。

【選択図】 図 1 a



## 【特許請求の範囲】

## 【請求項 1】

給水源（２）、飲料調製ユニット（３）、及び飲料を飲料注出領域（４）に供給するための出口（３ａ）を有するマシンなどの、飲料調製マシン（１）であって、

照明可能部分（１１Ａ、１１Ｂ、１１Ｃ、１１Ｄ、１１Ｅ、１１Ｆ、１１Ａ'、１１Ｂ'、１１Ｃ'、１１Ｄ'、１１Ｅ'、１１Ｆ'、１１Ｇ'、１１Ｈ'、２１Ａ、２１Ｂ、２１Ｃ、２１Ｄ、２１Ｅ、２１Ｆ、２１Ｇ、３１Ａ、３１Ｂ、３１Ｃ、３１Ｄ、３１Ｅ、３１Ｆ、４１Ａ、４１Ｂ、５１Ａ、５１Ｂ、５１Ｃ、５１Ｄ、５１Ｅ、５１Ｆ、５１Ｇ、５１Ｈ、５１Ｘ）により形成され、内側部分（１１０、１２０）の周囲で延びる、概ね外周の照明可能装置（１１、１１'、２１、３１、４１、５１）と、

プログラミング可能な制御装置（１００、１０５）などの、前記照明可能部分の照明を有効化及び無効化するための制御装置（１００、１０５）であって、例えば、プリント回路基板ＰＣＢ（１００）、及び該ＰＣＢにコネクタ（１００'）により接続されたコントローラ（１０５）を備え、任意により、飲料調製ユニット（３）のＩＴモジュール、ポンプ、熱調節器、及び／又は動力部など、前記マシン（１）の他の機能部を制御する、制御装置と、を有するユーザインタフェース（１０、１０'、２０、３０、４０、５０）を備え、

前記ユーザインタフェース（１０、１０'、２０、３０、４０、５０）は、任意により、前記マシン（１）の上部（１ａ）、前部（１ｂ）、又は側部（１ｃ）にある、飲料調製マシンにおいて、

前記制御装置（１００、１０５）は、前記照明可能部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）の一部のみを有効化するための、プログラミングされた設定などの少なくとも１つの設定を有することを特徴とする、飲料調製マシン（１）。

## 【請求項 2】

前記照明可能部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）は、前記概ね外周の照明可能装置（１１'）に沿って配置された、丸いスポット、又は、例えば、三角形、四角形、五角形、又は八角形のスポットなどの、多角形のスポットなどの１つ以上のスポット（１１Ａ'～１１Ｈ'）、及び／又は前記概ね外周の照明可能装置（１１、２１、３１、４１、５１）に沿って延びる１つ以上の細長いセグメントを有し、前記細長いセグメントは、

円形セクターに概ね沿って延びるセグメント（１１Ａ～１１Ｆ）、及び／又は楕円形セクターに概ね沿って延びるセグメント（５１Ａ～５１Ｘ）などの、湾曲セグメント（１１Ａ～１１Ｆ、５１Ａ～５１Ｘ）、

真っ直ぐなセグメント（２１Ａ、２１Ｃ、２１Ｅ、２１Ｆ、２１Ｇ、３１Ｂ、２１Ｃ、２１Ｄ、２１Ｅ）、

角度を成すセグメント（２１Ｂ、２１Ｄ、３１Ａ、３１Ｇ、４１Ａ、４１Ｂ）、

前記外周の照明可能装置（２１、３１、４１）の真っ直ぐな辺（２１Ａ、２１Ｂ、３１Ａ、４１Ａ、４１Ｂ）全体に沿って延びるセグメント、

前記外周の照明可能装置（２１、３１、４１）の、真っ直ぐな辺全体にわたって（２１Ｂ、３１Ａ、４１Ａ、４１Ｂ）、及び／若しくは真っ直ぐな辺の一部にわたって（２１Ｄ、３１Ａ、３１Ｆ、４１Ａ、４１Ｂ）延びる、角度を成すセグメント、並びに／又は前記外周の照明可能装置（２１、３１、４１）の、２つの真っ直ぐな辺のみに沿って（２１Ｂ、２１Ｄ、３１Ｆ、４１Ａ、４１Ｂ）、及び／若しくは３つ以上の辺に沿って（３１Ａ）延びるセグメントなど、前記外周の照明可能装置（２１、３１、４１）の複数の真っ直ぐな辺（２１Ｂ、３１Ａ、４１Ａ、４１Ｂ）に沿って延びる、角度を成すセグメント、並びに、

前記外周の照明可能装置（１１、２１、３１、４１、５１）の全長の部分にわたって延びるセグメントであって、この部分は全長（３１Ｃ、３１Ｄ、３１Ｅ）の約半分（３１Ａ、４１Ａ、４１Ｂ）、又は１／３（２１Ｂ）、又は１／４（３１Ｆ）、又は１／５、又

は1／6（11A～11F、21A、21D）、又は1／7、又は1／8（31B）、又は1／9（51A～51X）、又は1／10、又は1／12（21C、21E、21F、21G）、又は1／24と対応する、セグメント、から選択され得るセグメントを含む、請求項1に記載のマシン。

【請求項3】

前記概ね外周の照明可能装置（11、11'、21、31、41、51）は、単一の内側部分（110）の周囲で延び、又は、一対の内側部分（110、120）などのいくつかの内側部分（110、120）の周囲で、例えば、前記概ね外周の照明可能装置（51）が、離間した前記内側部分（110、120）の周囲及び間でほぼ8の形状になるように延び、任意により、単一の内側部分（110）は、複数の部分、例えば、複数の有効インタフェース部分（110A、110B、110C、110D）、複数の無効インタフェース部分、又は少なくとも1つの有効インタフェース部分（110E）と少なくとも1つの無効インタフェース部分（110F）との組み合わせから作製され、例えば、前記有効インタフェース部分はユーザセレクトの形態であり、及び／又は無効ユーザインタフェース部分はハウジングの一部の形態である、請求項1又は2に記載のマシン。

【請求項4】

前記内側部分は、セレクト（110E）若しくは複数のセレクト（110A、110B、110C、110D）などの、例えば、1つ以上のプッシュボタンの形態の、能動部分（110）、及び／又は、ハウジングの一部などの受動部分（110F、120）である、請求項1～3のいずれか一項に記載のマシン。

【請求項5】

前記概ね外周の照明可能装置（11、11'、21、31、41、51）は、以下の特徴：

発光素子（101、102、103）によって放出される光を拡散するための、半透明ウィンドなどの光拡散ウィンド（111）、

前記発光素子（101'）の形状をユーザに対して示すための、透明ウィンドなどの光透過ウィンド（111'）、

単一の色の発光素子（101'）、又は、白色、黄色、橙色、赤色、緑色、青色、及びピンク色、並びにこれらの混合から選択される色など、異なる色の発光素子（101、102、103）のグループ（100A、100B、100C、100D、100E、100F）などの異なる色の発光素子（101、102、103）を含む、複数の発光素子（101、101'、102、103）、

単一の色の発光素子（101'）によって、又は異なる色の発光素子（101、102、103）のグループ（100A、100B、100C、100D、100E、100F）によって照明可能である、前記外周の照明可能装置（11、11'、21、31、41、51）の各照明可能部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）であって、前記グループの前記発光素子は別個に又はグループで有効化可能である、各照明可能部分、並びに、

任意により、コネクタの対（100'、100''）などのコネクタ（100'、100''）により前記PCB又はあるPCB100に接続された、LEDなどの発光素子（101'、101、102、103）、の1つ以上を含む、請求項1～4のいずれか一項に記載のマシン。

【請求項6】

前記概ね外周の照明可能装置（11、11'、21、31、41、51）の前記照明可能部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）は、湾曲した及び／又は角度を成す線状構成など、前記内側部分（110、120）の周囲で横並びの線状構成にあり、任意により、前記概ね外周の照明可能装置の前記照明可能部分は、

単一の横並び線状構成（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）、又は2つ、3つ、若しくは



4つのほぼ平行な若しくは同心状の横並び線状構成にある、並びに／あるいは、

2つの隣接する照明可能部分が、互いに直接隣接している（11A～11F、21A～21G、31A～31F、41A～41B、51A～51H、51X）、又はハウジングの一部（11a）などのスペーサによって離間している（11A'～11H'）、横並び線状構成（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）にある、請求項1～5のいずれか一項に記載のマシン。

【請求項7】

照明可能部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）の前記照明が、実質的に、前記部分全体にわたって広がり、任意により、前記部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）の前記照明は、これらの部分全体にわたって、ほぼ均一な光強度、及び／又は、白色、黄色、橙色、赤色、緑色、青色、及びピンク、又はいくつかのこのような色の混合から生じる色から選択される色などの、ほぼ均一な色をもたらす、請求項1～6のいずれか一項に記載のマシン。

【請求項8】

前記制御装置（100、105）は、連続する部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）、例えば、線状横並び構成の連続する部分を、前記内側部分（110、120）を中心として、ある回転シーケンスで順次有効化するための少なくとも1つの設定を有し、任意により、

a) 時計方向及びその後の反時計方向の回転シーケンスで、又は、反時計方向及びその後の時計方向の回転シーケンスで順次有効化するための少なくとも1つの設定、

b) 前記回転シーケンスが完了すると、これを一度以上繰り返して順次有効化するための少なくとも1つの設定、

c) 回転シーケンスにわたって、及び／若しくは複数の連続する回転シーケンスの間で、例えば、

飲料調製手順、例えば、予備湿潤、及び抽出の連続する工程、及び／若しくは、

サービス手順、例えば、スケール除去手順の連続する工程、という異なる工程を示すように速度を変更し、順次有効化するための少なくとも1つの設定、

あるいは、

d) 特徴a)～c)の少なくとも2つの組み合わせを有する、請求項1～7のいずれか一項に記載のマシン。

【請求項9】

前記制御装置（100、105）は、前記連続する部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）を、前記内側部分（110、120）を中心として回転シーケンスで順次有効化し、全ての前記部分を有効化した後に、全ての前記部分を同時に無効化するための、少なくとも1つの設定を有する、請求項8に記載のマシン。

【請求項10】

前記制御装置（100、105）は、前記連続する部分（11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X）を、前記内側部分（110、120）を中心として回転シーケンスで順次有効化しながら、前に有効化した部分を前記回転シーケンスで順次無効化し、任意により、

a) 前記部分は、等しい有効化速度及び無効化速度、又は、前記無効化速度よりも速い有効化速度などの、異なる有効化速度及び無効化速度を有する、及び／若しくは、

b) 少なくとも2つ又は3つの部分が同時に有効化状態になる、少なくとも1つの設定を有する、請求項8又は9に記載のマシン。

【請求項11】

前記制御装置（１００、１０５）は、１つの部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）が間欠的に有効化及び無効化される、少なくとも１つの設定を有し、任意により、

ａ）前記内側部分（１１０、１２０）を中心に恒久的に有効化又は無効化された部分によって離間した、例えば、ほぼ均等に離間した、複数の部分又は部分のグループなどの複数の前記部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）が、同時に有効化及び無効化される、

ｂ）複数の２つの部分が交互に有効化及び無効化されるなど、前記部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）の２つが、交互に有効化及び無効化される、

ｃ）前記部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）は、一定の頻度で間欠的に有効化及び無効化され、例えば、いくつかの部分が一定の頻度で間欠的に有効化及び無効化される、又は

ｄ）特徴ａ）、ｂ）、及びｃ）の２つ又は３つの組み合わせである、請求項１～１０のいずれか一項に記載のマシン。

#### 【請求項１２】

前記設定に加えて、前記制御装置（１００、１０５）は、前記設定よりも速い速度で、部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）を有効化及び無効化して、例えば、

起動若しくはサービス（例えば、スケール除去）手順の実行など、異なる種類の手順の実行を区別するための少なくとも１つの更なる設定、及び／又は、

例えば、ルンゴ若しくはエスプレッソコーヒーの異なる飲料の調製手順などの同じ種類の異なる手順、又は、例えば、軽度の若しくは集中的スケール除去手順などの異なるサービス手順の実行を区別するための少なくとも１つの更なる設定を有する、請求項８～１１のいずれか一項に記載のマシン。

#### 【請求項１３】

有効化可能及び無効化可能な前記部分に加えて、少なくとも１つの部分が、前記設定又は前記更なる設定において、恒久的に有効化又は無効化されたままである、請求項８～１２のいずれか一項に記載のマシン。

#### 【請求項１４】

前記制御装置（１００、１０５）は、例えば、単一部分（１１Ａ～１１Ｆ、１１Ａ'～１１Ｈ'、２１Ａ～２１Ｇ、３１Ａ～３１Ｆ、４１Ａ～４１Ｂ、５１Ａ～５１Ｈ、５１Ｘ）、又は隣接する部分のグループなどの、少なくとも１つの部分が順次有効化される、少なくとも１つの設定を有する、請求項１～１３のいずれか一項に記載のマシン。

#### 【請求項１５】

前記外周の照明可能装置（１１、１１'、２１、３１、４１、５１）は、細長い形状に概ね沿っており、

ａ）例えば、１つ以上の円（１１、１１'）及び／若しくは楕円（５１）、又はその一部などの曲線（１１、１１'）を形成する、

ｂ）三角形（４１）、例えば、正方形（３１）、矩形、台形、若しくは平行四辺形である、四角形（３１）、五角形、六角形（２１）、七角形、八角形（１１'）、九角形、十角形、十一角形、若しくは十二角形などの、規則的若しくは不規則的な多角形（２１、３１、４１）、又はその一部を形成する、

ｃ）ストライプ（１１、２１、３１、４１、５１）の形状、及び／又は、前記細長い形状に概ね沿って配置された、別個の発光素子などの別個の要素（１１'）、例えば、ＬＥＤ（１０１'）又は発光可能光ファイバーの一部の形状に延びる、あるいは、

ｄ）特徴ａ）、ｂ）、及びｃ）の少なくとも２つの組み合わせである、請求項１～１４のいずれか一項に記載のマシン。

#### 【請求項１６】

前記制御装置（１００、１０５）は、ユーザに対して、



例えば、請求項 8 又は 9 に定義される設定による、加熱器の起動などの起動手順の実行を示すように、

例えば、請求項 14 に定義される設定による、飲料調製の準備完了までに必要な時間に関する指標をインタフェースが提示するスタンバイ手順を示すように、

例えば、請求項 8、9、又は 10 に定義される設定による、飲料調製手順、例えば、請求項 8 の選択肢 b) と組み合わせられた請求項 10 など、請求項 10 に定義される設定による、例えば、遠心処理の軸線 (3a) を取り囲む前記概ね外周の照明可能装置 (11、11'、21、31、41、51) による、遠心処理による飲料調製手順の実行を示すように、

例えば、請求項 14 に定義される設定による、任意により、全ての前記部分が有効化されている (11A~11F、11A'~11H'、21A~21G、31A~31F、41A~41B、51A~51H、51X)、ユーザ命令を受信する準備が完了した状態を示すように、

例えば、請求項 11 に記載される設定による、原材料カプセルなどのカプセルから、又は、例えば、ネットワーク又はポータブルメモリ装置に接続される、マシンインタフェースからの情報を読み取る手順の実行を示すように、

例えば、請求項 11 に定義される設定による、例えば、水の不足などの原材料の不足を示す、エラーの状態を示すように、

例えば、請求項 14 に定義される設定による、飲料調製プロセスのパラメータを設定するため、又はスタンバイ若しくは自動停止プロセスに入るためのタイマーを設定するためなどの、ユーザプログラミングモードの有効化を示すように、

例えば、請求項 8~14 のいずれか一項に定義される設定による、すすぎ、洗浄、スケール除去、又は水材料排出手順など、サービス手順の実行を示すように、かつ、

例えば、請求項 11 に定義される設定による、例えば、少なくとも 1 つの部分 (11A~11F、11A'~11H'、21A~21G、31A~31F、41A~41B、51A~51H、51X) の有効化及び無効化シーケンスのいくつかにより、例えば、ユーザセレクト (110、110A、110B、110C、110D) による、ユーザ命令の獲得の完了を示すように、

前記概ね外周の照明可能装置 (11、11'、21、31、41、51) を制御するための 1 つ以上の設定を含む、請求項 1~15 のいずれか一項に記載のマシン。

【発明の詳細な説明】

【技術分野】

【0001】

本発明の分野は、ユーザに情報を示すための、ユーザフレンドリーかつ人間工学的ユーザインタフェースを有する、飲料調製マシンに関する。例えば、典型的には、原材料容器内の飲料を淹出し、かつ飲料をそこから抽出するため、液体の原材料容器への循環、及び原材料容器の遠心作用によって飲料を調製するためのマシンなど、飲料調製マシンは、調製される飲料の原材料の、カプセルなどの容器を使用することがある。

【0002】

本記載の目的のため、「飲料」は、茶、コーヒー、熱い又は冷たいチョコレート、牛乳、スープ、ベビーフードなど、人間が消費できる任意の液体物質を含むことが意図される。「カプセル」とは、気密又は空気透過性パッケージなどのいずれかの材料の (例えば、プラスチック、アルミニウム、再利用可能、及び/又は生分解性パッケージなど)、任意の形状及び構造の (原材料を含む軟質ポッド又は硬質カートリッジを含む) の封入パッケージ内に、香味料成分などの、任意の予め小分けにされた飲料原材料を含むことを意図されている。

【背景技術】

【0003】

ある種の飲料調製マシンではカプセルを使用する。カプセルは、抽出若しくは溶解される原材料及び/又はマシン内にて保管され、自動的に供与されるか、そうでなければ、飲

料調製時に添加される原材料を収容する。いくつかの飲料マシンは充填手段を有する。充填手段は、液体（通常は水である）用のポンプを備える。ポンプは給水源から、低温であるか、実際、例えばサーモブロック等の加熱手段により加熱された液体を圧送する。

【0004】

特にコーヒー調製の分野において、飲料原材料を収容するカプセルが淹出装置内に挿入されるマシンの広範に開発されてきた。淹出装置は、カプセルの周囲で確実に閉鎖され、カプセルの第1面に水が注入され、カプセルの閉じた容積内で飲料が生成され、淹出された飲料が、カプセルの第2面から放出されて、カップ又はグラスなどの容器に回収され得る。

【0005】

淹出装置は、「新しい」カプセルの挿入、及び使用時のカプセルの取出しを容易にするように開発されてきた。典型的には、このような淹出装置は、カプセル内で原材料を淹出するための構造に対しカプセルを挿入／取り出すために、構造から相対的に可動な2つの部分を含む。淹出装置の可動部分の作動は電動化されてもよい。このようなシステムは例えば、欧州特許第1 767 129号に開示されている。淹出装置の他の実施例は、国際公開第2009／043630号、同第2005／004683号、及び同第2007／135136号に開示されている。

【0006】

遠心力を使用した飲料の調製もまた既知である。このような飲料の調製は、例えば、カプセルなどの容器内に、例えば、粉末及び／又は葉などの、飲料原材料（香味料成分）を供給する工程と、液体を容器内に循環させ、容器内において液体の圧力の勾配を生じるのに十分な速度で容器を回転させながら、液体と原材料を確実に相互作用させる工程とを含む。このような圧力は、中央から、容器の周縁部に向かって徐々に増加する。液体がコーヒー層などの原材料を通過するにつれて、コーヒー生成物などの原材料の抽出が起こり、容器の周縁部にて流出する液体抽出が得られる。国際公開第2008／148601号は、このような遠心原理を使用した装置の可能な実施例を記載している。この場合、原材料容器は、使用前に開けられる密封カプセルである。回転軸と位置合わせされた水注入器を含む、水連絡部分により、カプセルの中央に熱湯が供給される。容器はカプセルホルダーに保持され、カプセルホルダーは回転モーターによって回転させられる。液体連絡部分、及びカプセル保持部分の両方は、ローラーベアリングに沿って取り付けられる。飲料は、容器の蓋に開口部を形成する、複数の周辺針によって、カプセルから抽出される。回転軸を中心としてカプセルに遠心力がかけられ、熱湯が飲料の原材料を通過して、材料と相互作用して液体抽出物を生成し、生じた液体抽出物は、遠心力の効果により周辺開口部を通り、コレクタの衝突壁部に対して射出される。飲料を構成する液体抽出物はその後、装置の飲料ダクトを通じて放出され、カップなどの容器内に回収される。国際公開第2008／148650号は、例えば容器から出る遠心力を受けた液体により形成される圧力下で開くか、又は拡大する弁システムにより、容器、特にカプセルの下流に流れの制限が形成される装置について更に記載している。弁システムは、カプセルのリム部分に対して弾性的に付勢される、装置の可動制限部分によって形成され得る。米国特許第5,566,605号は、熱い飲料用の調製マシンのための、変形可能封止継手を有する、遠心タイプの抽出セルに関する。セルはドラム及びドラムと共に内部容積を画定するカバーを含む。カバーは、傾斜部と係合する取り付け耳部によってドラムと接続される。これらの先行技術の装置において、容器に水を供給する水連絡部分、及び容器を保持する保持部分は、バヨネットシステムなどのクロージャ機構によって、一緒に固定される装置のフレーム部分に沿って回転可能である。保持部分は一般的に、少なくとも1つのローラーベアリングにより、フレーム部分に取り付けられる。液体連絡部分もまた一般的に、これもまた少なくとも1つのローラーベアリングに沿って取り付けられたフレーム部分の一部である。遠心処理の間、高速で装置が回転されると、液体抽出物は、重要な軸方向及び径方向の力を生じ、この力はこれらの回転部分を分離する傾向にある。

【0007】

マシンに対して動作命令を与えるか、又はマシンからフィードバックを得るべく、ユーザがこのようなマシンと相互作用することを可能にするため、例えば、以下の文献に開示されているような、様々なシステムが当該技術分野において開示されている：オーストリア特許第410 377号、スイス特許第682 798号、独国特許第44 29 353号、同第202 00 419号、同第20 2006 019 039号、同第2007 008 590号、欧州特許第1448084号、同第1676509号、同第08155851. 2号、仏国特許第2 624 844号、英国特許第2 397 510号、米国特許第4, 377, 049号、同第4, 458, 735号、同第4, 554, 419号、同第4, 767, 632号、同第4, 954, 697号、同第5, 312, 020号、同第5, 335, 705号、同第5, 372, 061第、同第5, 375, 508号、同第5, 645, 230号、同第5, 685, 435号、同第5, 731, 981号、同第5, 836, 236号、同第5, 959, 869号、同第6, 182, 555号、同第6, 354, 341号、同第6, 759, 072号、米国特許出願公開第2007/0157820号、国際公開第97/25634号、同第99/50172号、同第2004/030435号、同第2004/030438号、同第2006/063645、同第2006/090183、同第2007/003062、同第2007/003990、同第2008/104751、同第2008/138710、同第2008/138820号及び同第2010/003932号。

#### 【発明の概要】

#### 【発明が解決しようとする課題】

#### 【0008】

したがって、例えば、コーヒー、チョコレート、カカオ、ミルク、スープ、又は茶調製マシンのインタフェースの人間工学性、相互作用性、直感性、ユーザフレンドリーであること、及び単純さから選択される飲料マシンインタフェースの少なくとも1つの特徴を改善することが、本発明の好ましい目的である。

#### 【課題を解決するための手段】

#### 【0009】

本発明はしたがって、飲料調製マシンに関する。マシンは、給水源、飲料調製ユニット、及び飲料を飲料注出領域に供給するための出口を有し得る。

#### 【0010】

例えば、マシンは、コーヒー、茶、チョコレート、カカオ、牛乳、及び／又はスープマシン、例えば、挽いたコーヒーなど、調製する飲料の原材料を含むカプセルに、熱湯若しくは冷水、又は別の液体を通すことによって飲料を調製するためのマシンである。このようなマシンの例は、国際公開第2007/042415号、同第2007/042414号、同第2007/134960号、同第2009/074550号、同第2009/130099号、同第2013/127476号、及びこれらに引用される文献に開示されている。

#### 【0011】

例えば、飲料マシンは、少なくとも1つの原材料から飲料を調製し、このような調製された飲料を注出するための容器保持ユニットを有する。例えば、マシンは、コーヒー、茶、チョコレート、カカオ、牛乳、及び／又はスープを調製するように構成されている。例えば、マシンは、容器保持ユニットを含む飲料処理モジュール内において、挽いたコーヒー、茶、チョコレート、カカオ、又はミルク粉末など、調製する飲料の香味料成分などの原材料を含む、保持されるカプセルなどのユニット内に保持される容器に、熱湯若しくは冷水、又は別の液体を通すことによって飲料を調製するように構成されている。

#### 【0012】

このような飲料調製は典型的には、例えば、水とミルク粉末など、複数の飲料原材料を混合する工程、及び／又は、挽いたコーヒー、若しくは水と茶の注入など、飲料原材料を注入する工程を含む。例えば、1回分に対応する所定量の飲料が、ユーザのリクエストによって形成及び注出される。このような1回分の量は、飲料の種類によって25～250

mLの範囲（例えば、カップ又はマグを充填する量）であり得る。形成及び注出される飲料は、リステロット、エスプレッソ、ルンゴ、カプチーノ、カフェラテ、アメリカンコーヒー、茶などから選択され得る。例えば、コーヒーマシンは、エスプレッソを注出する（1回あたり20～60mLの調節可能な量）、及び／又はルンゴを注出する（例えば、一回あたり70～200mLの範囲の量）ように構成されてもよい。

#### 【0013】

有利な実施形態において、飲料マシンは、例えば、国際公開第2008/148601号、同第2008/148604号、同第2008/148646号、同第2008/148650号、同第2008/148656号、同第2009/106175号、同第2009/106598号、同第2010/063644号、同第2010/066736号、同第2010/089329号、同第2011/023711号、PCT/EP13/077276号、及びPCT/EP13/077275号に開示される、遠心処理により原材料を組み合わせるタイプのものである。したがって、マシンは、例えば、内部に液体が注入され、原材料と液体とを混合するために、遠心軸を中心とした遠心処理を受ける、原材料カプセルを収容するための原材料混合チャンバを含む場合がある。原材料混合チャンバは、回転して原材料を混合するために、開閉することができる。

#### 【0014】

本発明のマシンは、照明可能部分により形成され、内側部分の周囲で延びる、概ね外周の照明可能装置と、プログラミング可能な制御装置などの、照明可能部分の照明を有効化及び無効化するための制御装置とを有する、ユーザインタフェースを含む。例えば、制御装置は、プリント回路基板PCB、及びあるPCBにコネクタにより接続されたコントローラなどのコントローラを含む。PCBは、単一のプリント基板、又は電氣的に、若しくは光学的に、ないしは別の方法により接続された、いくつかの並置された、若しくは離間したプリント基板から形成され得る。任意により、制御装置は、例えば、調製ユニットのITモジュール、ポンプ、熱調節器、及び／又は動力部など、このようなマシンの他の機能部を制御する。

#### 【0015】

典型的な実施形態において、ユーザインタフェースは、このようなマシンの上部、又は前部、又は側部にある。

#### 【0016】

本発明により、制御装置は、照明可能部分の一部のみを有効化するために、少なくとも1つの設定を有する。

#### 【0017】

照明可能部分は、概ね外周の照明可能装置に沿って配置された、例えば、丸いスポット、又は多角形のスポットなどの1つ以上のスポット、及び／又は概ね外周の照明可能装置に沿って延びる1つ以上の細長いセグメントを含み得る。このような細長いセグメントは、

円形セクターに概ね沿って延びるセグメント、及び／又は楕円形セクターに概ね沿って延びるセグメントなどの、湾曲セグメント、

真っ直ぐなセグメント、

角度を成すセグメント、

外周の照明可能装置の真っ直ぐな辺全体に沿って延びるセグメント、

外周の照明可能装置の、真っ直ぐな辺の全体にわたって、及び／若しくは真っ直ぐな辺の一部にわたって延びる、角度を成すセグメント、並びに／又は外周の照明可能装置の、2つの真っ直ぐな辺のみに沿って、及び／若しくは3つ以上の辺に沿って延びるセグメントなど、外周の照明可能装置の複数の真っ直ぐな辺に沿って延びる、角度を成すセグメント、並びに、

外周の照明可能装置の全長の部分にわたって延びるセグメントであって、この部分は全長の、約半分、又は1/3、又は1/4、又は1/5、又は1/6、又は1/7、又は1/8、又は1/9、又は1/10、又は1/12、又は1/24と対応する、セグメン

トと、から選択され得るセグメントを含む。

#### 【0018】

概ね外周の照明可能装置は、単一の内側部分の周囲で延び、又は一対の内側部分のようないくつかの内側部分の周囲で、例えば、概ね外周の照明可能装置が離間した内側部分の周囲及び間でほぼ8の形状になるように延びてよい。単一の内側部分は、複数の部分、例えば、複数の有効インタフェース部分、若しくは複数の無効インタフェース部分、又は少なくとも1つの有効インタフェース部分と少なくとも1つの無効インタフェース部分との組み合わせから作製され得る。例えば、このような有効インタフェース部分はユーザセクタの形態である。無効ユーザインタフェース部分はハウジングの一部の形態であり得る。ハウジングの一部は、インタフェースのハウジングに属する、及び／又は外部マシニングに属する。

#### 【0019】

内側部分は、セクタ若しくは複数のセクタなどの、例えば、1つ以上のプッシュボタン形の能動部分、及び／又は、例えば、ハウジングの一部などの受動部分であり得る。

#### 【0020】

概ね外周の照明可能装置は、以下の特徴：

発光素子によって放出される光を拡散するための、半透明ウインドなどの光拡散ウインド、

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発光素子の形状をユーザに対して示すための、透明ウインドなどの光透過ウインド、単一の色の発光素子、又は、白色、黄色、橙色、赤色、緑色、青色、及びピンク色、並びにこれらの混合から選択される色など、異なる色の発光素子のグループなどの異なる色の発光素子を含む、複数の発光素子、

単一の色の発光素子によって、又は異なる色の発光素子のグループによって照明可能である、外周の照明可能装置の各照明可能部分であって、このようなグループの発光素子は別個に又はグループで有効化可能である、各照明可能部分、並びに、

任意により、コネクタの対などのコネクタにより上記PCB又はあるPCBに接続された、LEDなどの発光素子、の1つ以上を含み得る。

#### 【0021】

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異なる色の光を放出する発光素子は、異なる種類の信号を伝達するために使用されてもよい。例えば、赤色は、警告の指標、又は熱生成の指標を伝達するために使用されてもよい。青色は、冷たい状態に関連する指標を伝達するために使用されてもよい。緑色は、状態、又は準備完了したことを示すために使用されてもよい。赤色又は青色は、飲料を温める、又は冷やす処理の指標を伝達するために使用され得る。橙色又は黄色は、ユーザプログラミングモード、又はサービスマード、例えば、マシニングのすすぎ、洗浄、又はスクール除去などを示すために使用されてもよい。したがって、ユーザに異なる指標を伝達するために、直感的なカラーコードを使用してもよい。

#### 【0022】

概ね外周の照明可能装置の照明可能な部分は、湾曲した及び／又は角度を成す線状構成など、内側部分の周囲で横並びの線状構成にあってもよい。例えば、概ね外周の照明可能装置の照明可能部分は、

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単一の横並び線状構成、又は2つ、3つ、若しくは4つのほぼ平行な若しくは同心状の横並び線状構成にある、並びに／あるいは、

2つの隣接する照明可能部分が、互いに直接隣接している、又はハウジングの一部などのスペーサによって離間している、横並び線状構成にある。

#### 【0023】

各照明可能部分の照明は、実質的に、この部分全体にわたって広がっていてもよい。任意により、各部分の照明は、これらの部分全体にわたって、ほぼ均一な光強度、及び／又はほぼ均一な色をもたらす。色は、白色、黄色、橙色、赤色、緑色、青色、及びピンク、又はいくつかのこのような色の混合から選択され得る。

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## 【 0 0 2 4 】

制御装置は、連続する部分、例えば、線状横並び構成の連続する部分を、内側部分を中心として、ある回転シーケンスで順次有効化するための少なくとも1つの設定を有することができ、例えば：

a) 時計方向及びその後の反時計方向のシーケンスで、又は、反時計方向及びその後の時計方向のシーケンスで順次有効化するための少なくとも1つの設定、

b) 回転シーケンスが完了すると、これを一度以上繰り返して順次有効化するための少なくとも1つの設定、及び／又は、

c) 回転シーケンスにわたって、及び／若しくは複数の連続する回転シーケンスの間で、例えば、

飲料調製手順、例えば、予備湿潤、及び抽出の連続する工程、及び／若しくは、

サービス手順、例えば、スケール除去手順の連続する工程、という異なる工程を示すように速度を変更し、順次有効化するための少なくとも1つの設定で行われる。

## 【 0 0 2 5 】

このような設定は、例えば、起動サイクル、又は飲料調製サイクル、又は清掃サイクルなど、任意の時点におけるサイクルの動作を示すために使用され得る。有利な実施形態において、このような設定は、遠心処理による飲料調製サイクルを示すために使用されてもよく、外周の照明可能装置は、任意により遠心処理軸の周囲で延び、遠心処理は、遠心処理軸を中心とした遠心処理を示す、回転シーケンスの複数の繰り返しなどの回転シーケンスによって示される。

## 【 0 0 2 6 】

制御装置は、連続する部分を、内側部分を中心として回転シーケンスで順次有効化し、全ての部分を有効化した後に、全ての部分を同時に無効化するための、少なくとも1つの設定を有し得る。

## 【 0 0 2 7 】

制御装置は、連続する部分を、内側部分を中心として回転シーケンスで順次有効化しながら、前に有効化した部分を回転シーケンスで順次無効化するための、少なくとも1つの設定を有し得る。任意により、これらの部分は、等しい有効化速度及び無効化速度、又は、無効化速度よりも速い有効化速度などの、異なる有効化速度及び無効化速度を有する。少なくとも2つ又は3つの部分が同時に有効化状態になり得る。

## 【 0 0 2 8 】

制御装置は、1つの部分が、間欠的に有効化及び無効化されるような、少なくとも1つの設定を有し得る。

## 【 0 0 2 9 】

例えば、このような設定は、エラーの表示、又は、ユーザセレクトによりユーザ命令が適切に獲得されたことを確認するなどの、マシン1が情報を獲得したことを確認する表示と関連付けられ得る。

## 【 0 0 3 0 】

内側部分を中心に恒久的に有効化又は無効化された部分によって離間した、例えば、ほぼ均等に離間した、複数の部分又は部分のグループなどの複数の部分が、同時に有効化及び無効化されてもよい。

## 【 0 0 3 1 】

複数の2つの部品が、交互に有効化及び無効化されるなど、これらの部分の2つが、交互に有効化及び無効化されてもよい。

## 【 0 0 3 2 】

例えば、このような設定は、例えば、ユーザセレクトによるユーザ入力、又はユーザによる別のアクションのマシン1による期待値と関連付けられ得る。

## 【 0 0 3 3 】

部分は、一定の頻度で間欠的に有効化及び無効化されてもよく、例えば、いくつかの部分が一定の頻度で間欠的に有効化及び無効化されてもよい。

## 【 0 0 3 4 】

上記の設定のいずれかに加えて、制御装置は、上記の設定よりも速い速度で部分を有効化及び無効化するための、少なくとも1つの更なる設定を有してもよい。

## 【 0 0 3 5 】

例えば、異なる種類の手順の実行を区別するために、異なる速度が使用されてもよい。例えば、起動又はサービス（スケール除去）手順の実行が、比較的遅い速度における1つ以上の回転シーケンスによって示されてもよく、飲料調製手順は、比較的速い速度における1つ以上の回転シーケンスによって示されてもよい。

## 【 0 0 3 6 】

例えば、ルンゴ若しくはエスプレッソコーヒーの異なる飲料の調製手順などの同じ種類の異なる手順、又は、例えば、軽度の若しくは集中的スケール除去手順などの異なるサービス手順の実行を区別するために異なる速度が実施され得る。

## 【 0 0 3 7 】

有効化可能及び無効化可能な部分に加えて、少なくとも1つの部分が、上記の設定又は更なる設定において、恒久的に有効化又は無効化されたままであり得る。

## 【 0 0 3 8 】

制御装置は、例えば、単一の部分、又は隣接する部分のグループなどの、少なくとも1つの部分が順次有効化される、少なくとも1つの設定を有し得る。

## 【 0 0 3 9 】

外周の照明可能装置は、細長い形状に概ね沿っており、

a) 例えば、1つ以上の円、及び／若しくは楕円、又はその一部などの曲線を形成する

b) 三角形、例えば、正方形、矩形、台形、若しくは平行四辺形である、四角形、五角形、六角形、七角形、八角形、十角形、九角形、十角形、十一角形、若しくは十二角形などの、規則的若しくは不規則的な多角形、又はその一部を形成する、並びに／あるいは、

c) ストライプの形状、及び／又は、細長い形状に概ね沿って配置された、別個の発光素子などの別個の要素、例えば、LED又は発光可能光ファイバーの一部の形状に延びる。

## 【 0 0 4 0 】

制御装置は、ユーザに対して、

例えば、連続する部分、例えば、線状横並び構成の連続する部分を、内側部分を中心として、ある回転シーケンスで順次有効化するための設定、及び任意により、全ての部分を有効化した後に、全ての部分を同時に無効化する種類の設定など、上記の設定による、加熱器の起動などの起動手順の実行を示すように、

例えば、単一部分、又は隣接する部分のグループなどの、少なくとも1つの部分が順次有効化される設定など、上記の設定による、飲料調製の準備完了までに必要な時間に関する指標をインタフェースが提示するスタンバイ手順を示すように、

例えば、連続する部分を内側部分を中心に回転シーケンスで順次有効化し、かつ全ての部分が有効化された後に全ての部分を同時に無効化するか、又は部分を有効化しながら、先に有効化された部分を、回転シーケンスで順次無効化する設定など、上記の設定による、飲料調製手順、例えば、回転シーケンスが完了すると、これを一度以上繰り返すこのような上記の設定のような、例えば、遠心処理の軸線を取り囲む概ね外周の照明可能装置による、遠心処理による飲料調製手順の実行を示すように、

例えば、上記の設定、例えば、少なくとも1つの部分が順次有効化され、任意により全ての部分が順次有効化される設定による、ユーザ命令を受信する準備が完了した状態を示すように、

例えば、上記の設定、例えば、1つの部分が間欠的に有効化及び無効化される設定による、原材料カプセルなどのカプセルから、又は、例えば、ネットワーク又はポータブルメモリ装置に接続される、マシンインタフェースからの情報を読み取る手順の実行を示すように、

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例えば、上記の設定、例えば、1つの部分が間欠的に有効化及び無効化される設定による、例えば、例えば水の不足などの原材料の不足を示す、エラーの状態を示すように、

例えば、上記の設定、例えば、少なくとも1つの部分が順次有効化される設定による、飲料調製プロセスのパラメータを設定するため、又はスタンバイ若しくは自動停止プロセスに入るためのタイマーを設定するためなどの、ユーザプログラミングモードの有効化を示すように、

例えば、上記の設定、例えば、全ての部分が有効化された後に全ての部分が同時に無効化されるか、若しくは先に有効化された部分が、回転シーケンスで順次無効化されるようにして、連続する部分が、内側部分を中心にして、回転シーケンスで順次有効化される設定、1つの部分が間欠的に有効化及び無効化される設定、又は少なくとも1つの部分が順次有効化される設定などによる、すすぎ、洗浄、スケール除去、又は水材料排出手順など、サービス手順の実行を示すように、並びに、

例えば、上記の設定、例えば、1つの部分が、間欠的に、例えば2回又は3回、有効化及び無効化される設定による、例えば、ユーザセレクトによる、ユーザ命令の獲得の完了を示すように、概ね外周の照明可能装置を制御するための1つ以上の設定を含み得る。

【0041】

本発明はここで、概略図を参照して説明される。

【図面の簡単な説明】

【0042】

【図1】本発明による飲料調製マシンの丸いインタフェースを概略的に例示している。

【図1a】図1のインタフェースの水平方向断面図を示している。

【図1A】直線A-Aに沿った、図1及び図1aのインタフェースの拡大断面図を例示している。

【図1B】直線B-Bに沿った、図1及び図1aのインタフェースの拡大断面図を例示している。

【図1x】本発明によるマシンのインタフェースのバリエーションを例示している。

【図2】本発明によるマシンに設置され得る、多角形の異なるインタフェースを例示している。

【図3】本発明によるマシンに設置され得る、多角形の異なるインタフェースを例示している。

【図4】本発明によるマシンに設置され得る、多角形の異なるインタフェースを例示している。

【図5】本発明によるマシンに設置され得る、湾曲した形状のインタフェースを例示している。

【図6】本発明による飲料調製マシンを例示している。

【発明を実施するための形態】

【0043】

図1～5は、本発明による飲料調製マシン1のための、異なるユーザインタフェース10、20、30、40、50を例示している。インタフェース10を備える飲料マシン1の実施例が図6に示される。

【0044】

代表的な飲料調製マシン1は、給水源2、及び飲料調製ユニット3を有し得る。給水源2は、水タンクであり得る。あるいは、マシンの給水源は、飲料マシンのいずれかの水タンクを手動で補充する必要がないように、都市の配水システムに直接接続することが可能なコネクタを含んでもよい。

【0045】

マシン1は、熱い又は冷たい飲料を調製するように構成されてもよい。マシン1は、例えば、水及び／又はミルクなどの液体キャリア、及び1つ以上の香味料成分並びに／又は質感成分(texturing ingredient)、例えば、チョコレート、カカオ、コーヒー、茶、牛乳、シロップ、砂糖、クリーム、乳化剤、乾燥又はゲルスープなどの、異なる原材料を組



み合わせるように構成され得る。原材料は、これを混合することにより、又は注入することにより、組み合わされ得る。好適なマシンは、例えば、国際公開第2009/074550号及び同第2009/130099号により詳細に開示されている。有利な実施形態において、飲料マシン1は、例えば、国際公開第2008/148601号、同第2008/148604号、同第2008/148646号、同第2008/148650号、同第2008/148656号、同第2009/106175号、同第2009/106598号、同第2010/063644号、同第2010/066736号、同第2010/089329号、同第2011/023711号、PCT/EP13/077276号、及びPCT/EP13/077275号に開示される、遠心処理により原材料を組み合わせるタイプのものである。したがって、マシン1は、内部に液体が注入され、原材料と液体とを混合するために、遠心軸3aを中心とした遠心処理を受ける、原材料カプセルを収容するための原材料混合チャンバ3b（典型的にはマシン1内に配置され、図6に点線で示される）を含む場合がある。原材料混合チャンバ3bは、（例えば、ハンドル1aを作動させることにより上部1aを旋回させるか、又は昇降させて）開閉することができ、回転させて原材料を混合することができる。

#### 【0046】

飲料マシン1は、典型的には、単一の出口、又は二重出口であり得る、出口3aを有する。出口3aは、注出領域4に飲料を供給するように構成され得る。注出領域4は、グラス、カップ、又はマグなどの容器を受容するように構成され得る。注出領域は、例えば欧州特許第1867260号、又は国際公開第2009/074557号に開示されるような、任意の種類のものであり得る。

#### 【0047】

飲料マシン1は、ユーザインタフェース10を含み、これは、図1、図1A、及び図1Bにより詳細に例示されている。あるいは、インタフェース10は、図1x~5に例示されるインタフェース10'、20、30、40、50のいずれか、又は本発明の領域に包含される、そのバリエーションにより代替することができる。

#### 【0048】

ユーザインタフェース10、10'、20、30、40、50は全て、

照明可能部分11A、11B、11C、11D、11E、11F、11A'、11B'、11C'、11D'、11E'、11F'、11G'、11H'、21A、21B、21C、21D、21E、21F、21G、31A、31B、31C、31D、31E、31F、41A、41B、51A、51B、51C、51D、51E、51F、51G、51H、51Xにより形成され、内側部分110、120の周囲で延びる、概ね外周の照明可能装置11、11'、21、31、41、51と、

プログラミング可能な制御装置などの、照明可能部分11A~11F、11A'~11H'、21A~21G、31A~31F、41A~41B、51A~51H、51Xの照明を有効化及び無効化するための制御装置100、105であって、例えば、プリント回路基板PCB100、及びPCBにコネクタ100'により接続されたコントローラなどのコントローラ105を備えたプログラミング可能な制御装置100、105とを有する。

#### 【0049】

制御装置100、105は、飲料調製ユニット3のITモジュール、ポンプ、熱調節器、及び／又は動力部など、このようなマシン1の他の機能部を制御し得る。

#### 【0050】

典型的な実施形態において、ユーザインタフェース10、10'、20、30、40、50は、このようなマシン1の上部1a、前部1b、又は側部1cにある。図6において、例えば、ユーザインタフェース10は、マシン1の上部1aに設けられている。

#### 【0051】

制御装置100、105は、照明可能部分11A~11F、11A'~11H'、21A~21G、31A~31F、41A~41B、51A~51H、51Xの一部のみを有

効化するための、プログラミングされた設定などの少なくとも1つの設定を組み込んでもよい。

【0052】

例えば、図1xに例示されるように、照明可能部分は、概ね外周の照明可能装置11'に沿って配置された、丸い又は多角形のスポットなど、1つ以上の照明可能スポット11A'～11H'を含む場合がある。例えば、図1、2、3、4、及び5に例示されるように、照明可能部分は、概ね外周の照明可能装置11、21、31、41、51に沿って延びる1つ以上の細長いセグメント11A～11F、21A～21G、31A～31F、41A～41B、51A～51H、51Xを有する場合がある。

【0053】

このような細長いセグメントは、

円形セクター11A～11Fに概ね沿って延びるセグメント（図1）、及び／又は楕円形セクター51A～51Xに概ね沿って延びるセグメント（図6）などの、湾曲セグメント11A～11F、51A～51X、

真っ直ぐなセグメント21A、21C、21E、21F、21G、31B、21C、21D、21E（図2～4）、

角度を成すセグメント21B、21D、31A、31G、41A、41B（図2～4））、

外周の照明可能装置21、31、41の真っ直ぐな辺21A、21B、31A、41A、41B全体に沿って延びるセグメント（図2～4）、

外周の照明可能装置21、31、41の、真っ直ぐな辺全体にわたって21B、31A、41A、41B、及び／若しくは真っ直ぐな辺の一部にわたって21D、31A、31F、41A、41B延びる、角度を成すセグメント、並びに／又は外周の照明可能装置21、31、41（図2～4）の、2つの真っ直ぐな辺のみに沿って21B、21D、31F、41A、41B、及び／若しくは3つ以上の辺に沿って31A延びるセグメントなど、外周の照明可能装置21、31、41の複数の真っ直ぐな辺21B、31A、41A、41Bに沿って延びる、角度を成すセグメント、

外周の照明可能装置11、21、31、41、51の全長の部分にわたって延びるセグメントであって、各部分は、外周の照明可能装置の全長の、約半分である31A、41A、41B（図3及び図4）、又は1/3である21B（図2）、又は1/4である31F（図3）、又は1/5、又は1/6である11A～11F、21A、21D（図1及び図2）、又は1/7、又は1/8である31B（図3）、又は1/9である51A～51X（図5）、又は1/9、又は1/12である21C、21E、21F、21G（図2）、又は1/24である31C、31D、31E（図3）と対応する、セグメントと、並びに

これらの組み合わせ、例えば、異なる長さのセグメント（図2～5）から、若しくは同じ長さのセグメント（図1）から作製される、及び／又は湾曲セグメント及び真っ直ぐなセグメントの組み合わせ（図示されない）から作製される、外周の照明可能装置であるセグメント、から選択され得る。

【0054】

外周の照明可能装置11、11'、21、31、41、51は、単一の内側部分110（図1～4）、又はいくつかの内側部分110、120の周辺に延びることがある。例えば、このような配置は、例えば、外周の照明可能装置51がほぼ8の形状になるように（図5）、一対の内側部分110、120の周囲で延びる。

【0055】

単一の内側部分110は、いくつかの部分、例えば、複数の有効インタフェース部分110A、110B、110C、110D（図1及び図2）、複数の無効インタフェース部分、又は少なくとも1つの有効インタフェース部分110Eと少なくとも1つの無効インタフェース部分110Fとの組み合わせ（図4）から作製されることができ、例えば、有効インタフェース部分はユーザセクタの形態であり、及び／又は無効ユーザインタフェ

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ース部分はハウジングの一部の形態である。

【0056】

内側部分は、例えば、セレクトア110E若しくは複数のセレクトア110A、110B、110C、110Dなどの、例えば、1つ以上のプッシュボタンの形態の、能動部分110、及び／又はハウジングの一部などの受動部分110F、120、から選択され得る。

【0057】

ユーザセレクトア110、110A、110B、110C、110D、110Eは典型的にはコントローラ105、又はPCB100に接続され、例えば、生成すべき、所望の量及び／又は濃度、及び／又は味などのいくつかの特徴を有する飲料の調製を開始するか、又は、例えば、すすぎ若しくは洗浄、若しくはスケール除去などサービス手順を実行するため、又はマシン1をオン若しくはオフにするため、又はユーザプログラミングモードに入るための命令などの、ユーザ命令を受信するように設定されてもよい。ユーザセレクトア110、110A、110B、110C、110D、110Eは、ユーザ命令のみを受けるとして設定されてもよく、又はユーザに対して情報を示すように更に設定されてもよく、例えば、またユーザセレクトア自体がコントローラ105によって制御される発光装置を備えてもよい。例えば、ユーザセレクトアは、セレクトアと関連する機能部が、マシン1の使用時の所定の時点で利用可能であるかどうかによって、照明可能である。例えば、スケール除去プロセス中に飲料調製プロセスを開始することは不可能である。これは、対応するユーザセレクトアの適切な照明によって示すことができる。これは、サービス手順中にはユーザが飲料を注文できないということを意味するものではなく、サービス手順が中断される必要があるか、又は最後まで実行されてから、飲料調製の命令を実行することを意味している。例えば、コントローラは、マシン1が、ユーザリクエストを実行可能な状態にある後の時点で実行するために、特定のユーザリクエストを記憶してもよい。例えば、記憶されたユーザリクエストを後で実行する実施例に関しては、例えば、国際公開第2011/020779号を参照せよ。当然、特定のプロセスを実行する入力を、このようなプロセスの実行が不可能であるかぎり、アクセプトしないように、マシンを設定することもまた可能である。

【0058】

外周の照明可能装置11、11'、21、31、41、51は、以下の特徴：

発光素子101、102、103によって放出される光を拡散するための、半透明ウィンドなどの光拡散ウィンド111（図1、図1A、及び図2B）、

発光素子101'の形状をユーザに対して示すための、透明ウィンドなどの光透過ウィンド111'（図2x）、

単一の色の発光素子101'、又は、白色、黄色、橙色、赤色、緑色、青色、及びピンク色、並びにこれらの混合から選択される色など、異なる色の発光素子101、102、103（図1a、及び図1A）のグループ100A、100B、100C、100D、100E、100Fなどの異なる色の発光素子101、102、103を含む、複数の発光素子101、101'、102、103、

単一の色の発光素子101'によって、又は異なる色の発光素子101、102、104のグループ100A、100B、100C、100D、100E、100Fによって照明可能である、外周の照明可能装置11、11'、21、31、41、51の各照明可能部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xであって、このようなグループの発光素子は別個に又はグループで有効化可能である、各照明可能部分、並びに、

任意により、コネクタの対100'、100''などのコネクタ100'、100''（図1a、図1A及び図1B）により上記PCB又はあるPCB100に接続された、LEDなどの発光素子101'、101、102、103、の1つ以上を含んでもよい。

【0059】

外周の照明可能装置11、11'、21、31、41、51の、照明可能部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51

A～51H、51Xは、湾曲した構成（図1～1x、及び図5）、及び／又は角度を成す線状構成（図2～4）など、内側部分110、120の周囲で横並びの線状構成にあってよい。このような照明可能部分は、

単一の横並び線状構成11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X（図1～5）、又は2つ、若3つ、若しくは4つのほぼ平行な横並び線状構成にある、及び／あるいは、

2つの隣接する照明可能部分が、互いに直接隣接している11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X（図1、図2、図3、図4、及び図5）、又はハウジングの一部11aなどのスペースによって離間している11A'～11H'（図1x）、横並び線状構成11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xにあり得る。

#### 【0060】

照明部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xの照明は、実質的に、これらの部分全体にわたって広がり得る。任意により、このような部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xの照明は、これらの部分全体にわたって、ほぼ均一な光強度、及び／又は、白色、黄色、橙色、赤色、緑色、青色、及びピンク、又はいくつかのこのような色の混合から生じる色から選択される色などの、ほぼ均一な色をもたらす。

#### 【0061】

制御装置100、105は、連続する部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X、例えば、線状横並び構成の連続する部分を、内側部分110、120を中心として、ある回転シーケンスで順次有効化するための少なくとも1つの設定を有し得る。任意により、

a) 時計方向及びその後の反時計方向のシーケンスで、又は、反時計方向及びその後の時計方向のシーケンスで順次有効化され、

b) 回転シーケンスが完了すると、これを一度以上繰り返して順次有効化され、及び／又は、

c) 回転シーケンスにわたって、及び／若しくは複数の連続する回転シーケンスの間で、

飲料調製手順、例えば、予備湿潤、及び抽出の連続する工程、及び／若しくは、

サービス手順、例えば、スケール除去手順の連続する工程、という異なる工程を示すように速度を変更し、順次有効化される。

#### 【0062】

このような設定は、例えば、起動サイクル、又は飲料調製サイクル、又は清掃サイクルなど、任意の時点におけるサイクルの動作を示すために使用され得る。有利な実施形態において、このような設定は、遠心処理による飲料調製サイクルを示すために使用されてもよく、外周の照明可能装置は、任意により遠心処理軸3aの周囲で延び、遠心処理は、遠心処理軸3aを中心とした遠心処理を示す、回転シーケンスの複数の繰り返しの回転シーケンスによって示される。

#### 【0063】

制御装置100、105は、連続する部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xを、内側部分110、120を中心として回転シーケンスで順次有効化し、全ての部分を有効化した後に、全ての部分を同時に無効化するための、少なくとも1つの設定を有し得る。

#### 【0064】

制御装置100、105は、連続する部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xを、内側部分110、120を中心として回転シーケンスで順次有効化しながら、前に有効化させた部分

を回転シーケンスで順次無効化するための、少なくとも1つの設定を有し得る。部分は、等しい有効化速度及び無効化速度、又は、無効化速度よりも速い有効化速度などの、異なる有効化速度及び無効化速度を有し得る。少なくとも2つ又は3つの部分が同時に有効化状態になり得る。

【0065】

制御装置100、105は、1つの部分、11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xが、間欠的に有効化及び無効化される、少なくとも1つの設定を有し得る。

【0066】

例えば、このような設定は、エラーの表示、又は、ユーザセレクトによりユーザ命令が適切に獲得されたことを確認するなどの、マシン1が情報を獲得したことを確認する表示と関連付けられ得る。

【0067】

複数のこのような部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xは、同時に有効化及び無効化されてもよい。例えば、複数の部分、又は部分のグループが、内側部分110、120を中心に他の恒久的に有効化又は無効化された部分により離間している。このような部品、又は部品のグループは、例えば、内側部分110、120を中心に均等に離間している。

【0068】

このような部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xの2つが、交互に有効化及び無効化され得る。

【0069】

例えば、2つの部分が、交互に有効化及び無効化される。

【0070】

例えば、このような設定は、例えば、ユーザセレクトによるユーザ入力、又はユーザによる別のアクションのマシン1による期待値と関連付けられ得る。

【0071】

このような部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xが、一定の頻度で間欠的に有効化及び無効化され得る。例えば、いくつかの部分が、一定の頻度で間欠的に有効化及び無効化される。

【0072】

このような設定に加えて、制御装置100、105は、上記の設定よりも速い速度で、部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xを有効化及び無効化するための少なくとも1つの他の設定を有し得る。

【0073】

例えば、異なる種類の手順の実行を区別するために、異なる速度が使用されてもよい。例えば、起動又はサービス（例えば、スケール除去）手順の実行が、比較的遅い速度における1つ以上の回転シーケンスによって示されてもよく、飲料調製手順は、比較的速い速度における1つ以上の回転シーケンスによって示されてもよい。

【0074】

例えば、異なる速度は、例えば、ルンゴ若しくはエスプレッソコーヒーの異なる飲料の調製手順などの同じ種類の異なる手順、又は軽度の若しくは集中的スケール除去手順などの異なるサービス手順実行を区別するために、実施され得る。

【0075】

有効化可能及び無効化可能な部分に加えて、少なくとも1つの部分が、上記の設定又は上記の更なる設定において、恒久的に有効化又は無効化されたままであってもよい。

【0076】

例えば、原材料（例えば、水）利用可能性が最低レベルに近づいているなど、非停止警告が、恒久的有効部分によって示されてもよい。非停止警告の別の例は、短い時間内にサービス（例えば、スケール除去）プロセスを行うことの必要性に関連し得る。

【0077】

制御装置100、105は、例えば、単一部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51X、又は隣接する部分のグループなどの、少なくとも1つの部分が順次有効化される、少なくとも1つの設定を有し得る。

【0078】

外周の照明可能装置11、11'、21、31、41、51は、細長い形状に概ね沿っており、

a) 例えば、1つ以上の円11、11'（図1、図1a、及び図1x）及び／若しくは楕円51（図5）、又はその一部などの曲線11、11'を形成する、

b) 三角形41（図4）、例えば、正方形31（図3）、矩形、台形、若しくは平行四辺形である、四角形31、五角形、六角形21（図2）、七角形、八角形11'（図1x）、十角形、九角形、十角形、十一角形、若しくは十二角形などの、規則的若しくは不規則的な多角形21、31、41、又はその一部を形成する、

c) ストライプ11、21、31、41、51（図1、図2～5）の形状、及び／又は細長い形状に概ね沿って配置された、別個の発光素子などの別個の要素11'（図1x）

d) 湾曲部分、及び真っ直ぐ若しくは角度を成す部分から形成された外周の照明可能装置などの、特徴a)、b)、及びc)の少なくとも2つの組み合わせである。

【0079】

制御装置100、105は、ユーザに対して、

例えば、連続する部分、例えば、線状横並び構成の連続する部分を、内側部分を中心として、ある回転シーケンスで順次有効化するための設定、及び任意により、全ての部分を有効化した後に、全ての部分を同時に無効化する種類の設定など、上記の設定による、加熱器の起動などの起動手順の実行を示すように、

例えば、単一部分、又は隣接する部分のグループなどの、少なくとも1つの部分が順次有効化される設定など、上記の設定による、飲料調製の準備完了までに必要な時間に関する指標をインタフェースが提示するスタンバイ手順を示すように、

例えば、連続する部分を内側部分を中心に回転シーケンスで順次有効化し、かつ全ての部分が有効化された後に全ての部分を同時に無効化するか、又は先に有効化された部分を、回転シーケンスで順次無効化する設定など、上記の設定による、飲料調製手順、例えば、回転シーケンスが完了すると、これを一度以上繰り返すこのような上記の設定のような、例えば、遠心処理の軸線を取り囲む概ね外周の照明可能装置による、遠心処理による飲料調製手順の実行を示すように、

例えば、上記の設定、例えば、少なくとも1つの部分が順次有効化され、任意により全ての部分が順次有効化される設定による、ユーザ命令を受信する準備が完了した状態を示すように、

例えば、上記の設定、例えば、1つの部分が間欠的に有効化及び無効化される設定による、原材料カプセルなどのカプセルから、又は、例えば、ネットワーク又はポータブルメモリ装置に接続される、マシンインタフェースからの情報を読み取る手順の実行を示すように、

例えば、上記の設定、例えば、1つの部分が間欠的に有効化及び無効化される設定による、例えば、例えば水の不足などの原材料の不足を示す、エラーの状態を示すように、

例えば、上記の設定、例えば、少なくとも1つの部分が順次有効化される設定による、飲料調製プロセスのパラメータを設定するため、又はスタンバイ若しくは自動停止プロセスに入るためのタイマーを設定するためなどの、ユーザプログラミングモードの有効化を示すように、

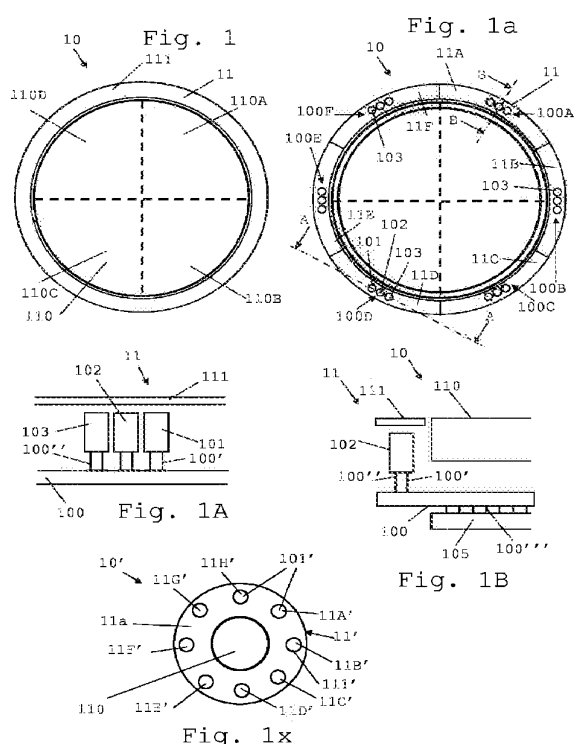


例えば、上記の設定成、例えば、全ての部分が有効化された後に全ての部分が同時に無効化されるか、若しくは先に有効化された部分が、回転シーケンスで順次無効化されるようにして、連続する部分が、内側部分を中心にして、回転シーケンスで順次有効化される設定、1つの部分が間欠的に有効化及び無効化される設定、又は少なくとも1つの部分が順次有効化される設定などによる、すすぎ、洗浄、スケール除去、又は水材料排出手順など、サービス手順の実行を示すように、並びに、

例えば、上記の設定、例えば、1つの部分11A～11F、11A'～11H'、21A～21G、31A～31F、41A～41B、51A～51H、51Xが、間欠的に、例えば2回又は3回、有効化及び無効化される設定による、例えば、ユーザセクタ110、110A、110B、110C、110Dによる、ユーザ命令の獲得の完了を示すように、概ね外周の照明可能装置11、11'、21、31、41、51を制御するための1つ以上の設定を含み得る。

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【図1-1x】



【図2】

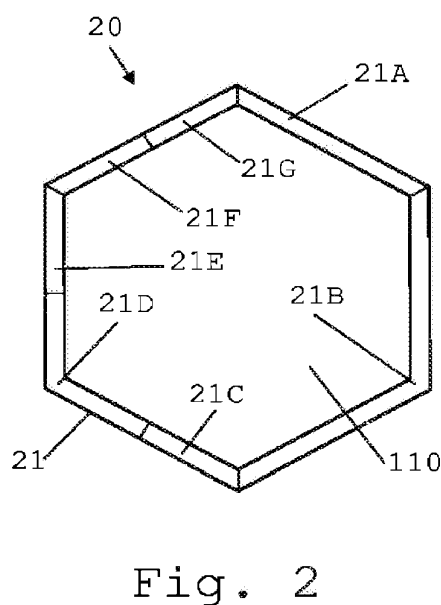


Fig. 2

【図 3】

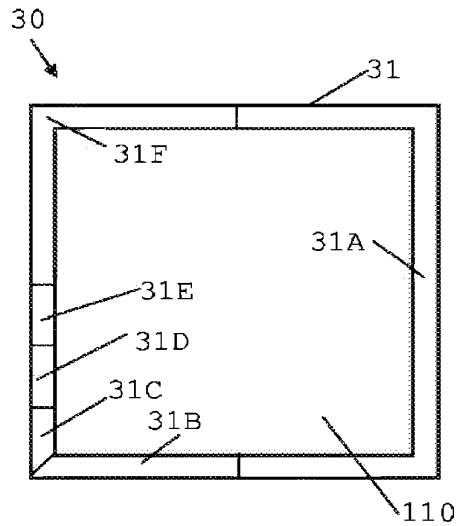


Fig. 3

【図 4】

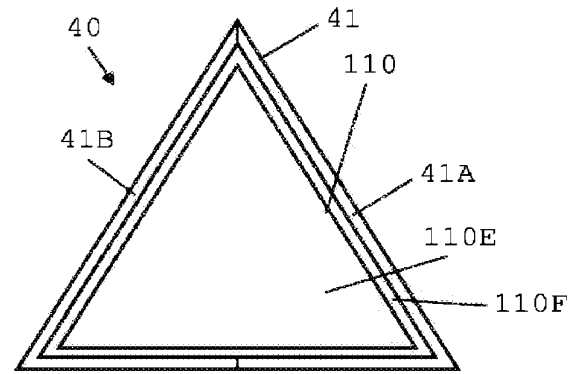


Fig. 4

【図 5】

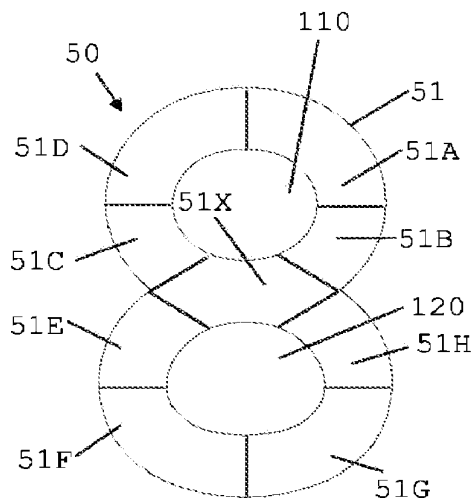


Fig. 5

【図 6】

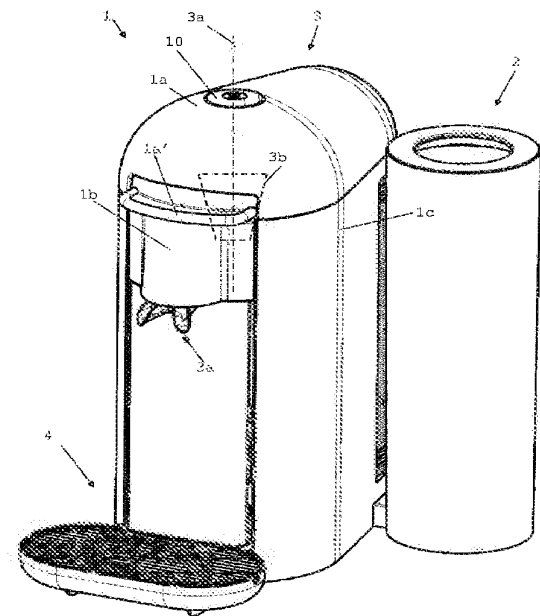


Fig. 6



## 【国際調査報告】

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2014/077494A. CLASSIFICATION OF SUBJECT MATTER  
INV. A47J31/52 G07F9/02  
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
A47J G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 528 044 A1 (NESTEC SA [CH]) 28 November 2012 (2012-11-28) paragraph [0031] - paragraph [0053]; figures 1,2	1-16
X	WO 2010/037806 A1 (NESTEC SA [CH]; CAHEN ANTOINE [CH]; MOERI PETER [CH]) 8 April 2010 (2010-04-08) page 13, line 26 - page 23, line 28; figures 1-9	1-16
A	US 4 554 419 A (KING EDDIE W [US] ET AL) 19 November 1985 (1985-11-19) cited in the application the whole document	1-16
	----- -/-	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents :

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\*S\* document member of the same patent family

Date of the actual completion of the international search

2 April 2015

Date of mailing of the international search report

14/04/2015

Name and mailing address of the ISA/

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Klintebäck, Daniel

## INTERNATIONAL SEARCH REPORT

International application No PCT/EP2014/077494
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 377 049 A (SIMON DONALD R ET AL) 22 March 1983 (1983-03-22) cited in the application the whole document	1-16
A	US 6 182 555 B1 (SCHEER RICK [US] ET AL) 6 February 2001 (2001-02-06) cited in the application the whole document	1-16

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/077494

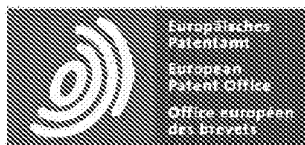
Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2528044	A1	28-11-2012	
		AR 086583 A1	08-01-2014
		AU 2012260798 A1	28-11-2013
		CA 2836109 A1	29-11-2012
		CN 103562975 A	05-02-2014
		EP 2528044 A1	28-11-2012
		EP 2715686 A1	09-04-2014
		JP 2014515282 A	30-06-2014
		KR 20140035442 A	21-03-2014
		SG 194919 A1	30-12-2013
		US 2014373723 A1	25-12-2014
		WO 2012160190 A1	29-11-2012
WO 2010037806	A1	08-04-2010	
		AU 2009299846 A1	08-04-2010
		CA 2736927 A1	08-04-2010
		CN 102170813 A	31-08-2011
		EP 2362743 A1	07-09-2011
		EP 2529648 A1	05-12-2012
		ES 2399392 T3	01-04-2013
		HK 1161963 A1	22-03-2013
		JP 2012504439 A	23-02-2012
		JP 2014208281 A	06-11-2014
		PT 2362743 E	12-12-2012
		RU 2011117342 A	10-11-2012
		US 2011168026 A1	14-07-2011
		WO 2010037806 A1	08-04-2010
US 4554419	A	19-11-1985	
		AU 578255 B2	20-10-1988
		AU 3582284 A	06-06-1985
		BR 8406120 A	24-09-1985
		CA 1239680 A1	26-07-1988
		DE 3443796 A1	13-06-1985
		ES 8609780 A1	16-12-1986
		FR 2556116 A1	07-06-1985
		GB 2151081 A	10-07-1985
		GR 81091 A1	07-03-1985
		IT 1178647 B	09-09-1987
		JP H0313583 U	12-02-1991
		JP H0639397 Y2	12-10-1994
		JP S60153591 A	13-08-1985
		MX 162297 A	22-04-1991
		US 4554419 A	19-11-1985
		ZA 8409116 A	31-07-1985
US 4377049	A	22-03-1983	NONE
US 6182555	B1	06-02-2001	NONE

## フロントページの続き

(81) 指定国 AP (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), EA (AM, AZ, BY, KG, KZ, RU, TJ, TM), EP (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OA (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG), AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US

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F ターム (参考) 4B104 AA19 AA20 BA53 BA81 BA82 DA09 DA11 DA51 DA54 DA55  
EA20 EA40



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## DESCRIPTION JP2017503552A

<sup>10</sup> Simple ergonomic user interface for beverage machines.

### [0001]

<sup>14</sup> The field of the invention relates to a beverage preparation machine having a user-friendly and ergonomic user interface for showing information to a user. For example, beverage preparation machines may use containers, such as capsules, of the raw materials of the beverage to be prepared, such as machines for preparing beverages by circulation of liquid into the raw material container and centrifugal action of the raw material container, typically to brew and extract beverages from the raw material container.

### [0002]

<sup>23</sup> For the purposes of this description, a “beverage” is intended to include any liquid substance that can be consumed by humans, such as tea, coffee, hot or cold chocolate, milk, soup, baby food, and the like.

<sup>26</sup> “Capsules” are intended to include any pre-divided beverage ingredient, such as a flavoring ingredient, within an enclosed package of any material (e.g., plastic, aluminum, reusable, and/or biodegradable packages, etc.), any shape and structure (including soft pods or hard cartridges containing the ingredient), such as an air-tight or air-permeable package.

### [0003]

<sup>33</sup> Some beverage preparation machines use capsules.

<sup>34</sup> The capsule contains the raw materials to be extracted or dissolved and/or stored in a machine and either automatically dispensed or otherwise added during beverage preparation.

<sup>36</sup> Some beverage machines have a filling means.

<sup>37</sup> The filling means comprises a pump for a liquid (usually water).

38 The pump pumps liquid from a water supply source, which is cold or in fact heated by heating means, for example thermoblocks.

[0004]

43 In particular in the field of coffee preparation, machines have been extensively developed in which capsules containing beverage ingredients are inserted into brewing devices.

45 The brewing device is reliably closed around the capsule, water is injected into the 1st side of the capsule, a beverage is produced in the closed volume of the capsule, and the brewed beverage can be released from the 2nd side of the capsule and collected in a container such as a cup or glass.

[0005]

52 The brewing device has been developed to facilitate the insertion of a “new” capsule and the removal of the capsule in use.

54 Typically, such brewing device comprises 2 parts that are relatively movable from the structure to insert/remove the capsule relative to the structure for brewing the raw material in the capsule.

57 The actuation of the movable part of the brewing device may be motorized.

58 Such a system is disclosed, for example, in EP 1 767 129.

59 Other examples of brewing devices are disclosed in WO 2009/04330, WO 2005/004683, and WO 2007/135136.

[0006]

64 Preparation of beverages using centrifugal force is also known.

65 Preparation of such beverages comprises the steps of providing beverage ingredients (flavour ingredients), such as, for example, powders and/or leaves, into a container, such as, for example, a capsule, and ensuring that the liquid and the ingredients interact while circulating the liquid into the container and rotating the container at a speed sufficient to create a gradient in the pressure of the liquid in the container.

70 Such pressure gradually increases from the center towards the periphery of the container.

71 As the liquid passes through the raw material, such as the coffee layer, extraction of the raw material, such as the coffee product, occurs, resulting in liquid extraction that flows out at the periphery of the container.

74 WO 2008/148601 describes a possible embodiment of a device using such a centrifugal principle.

76 In this case, the ingredient container is a sealed capsule that is opened before use.

77 The hot water is supplied to the center of the capsule by a water connection portion comprising a water injector aligned with the axis of rotation.

79 The container is held in a capsule holder, which is rotated by a rotary motor.

80 Both the liquid communication portion and the capsule holding portion are mounted along the roller bearing.

82 The beverage is extracted from the capsule by a plurality of peripheral needles forming an opening in the lid of the container.

84 When centrifugal force is applied to the capsule about the axis of rotation, hot water passes through the raw material of the beverage and interacts with the material to produce a liquid extract, which is injected against the impingement wall of the collector through the peripheral opening due to the effect of centrifugal force.

88 The liquid extract comprising the beverage is then released through the beverage duct of the device and collected in a container such as a cup.

90 WO 2008/148650 further describes a device in which a flow restriction is formed downstream of a container, in particular a capsule, for example by a valve system that opens or expands under pressure formed by a centrifugally-forced liquid exiting the container.

93 The valve system may be formed by a movement limiting portion of the device, which is resiliently biased against a rim portion of the capsule.

95 U.S. Pat. No. 5,566,605 relates to a centrifugal type extraction cell with a deformable sealing joint for a preparation machine for hot beverages.

97 The cell includes a drum and a cover defining an interior volume with the drum.

98 The cover is connected to the drum by means of a mounting lug that engages the ramp.

99 In these prior art devices, the water communication portion for supplying water to the container and the holding portion for holding the container are rotatable along the frame portion of the device secured together by a closure mechanism such as a bayonet system.

102 The retaining portion is generally attached to the frame portion by at least 1 roller bearing.

103 The liquid communication portion is also generally part of a frame portion which is also mounted along at least one roller bearing.

105 During the centrifugation process, when the device is rotated at high speed, the liquid extract creates significant axial and radial forces, which tend to separate these rotating parts.

[0007]

*110* Various systems are disclosed in the art, for example as disclosed in the following documents,  
to allow a user to interact with such machines to provide operational instructions to or  
obtain feedback from the machines: Australian Patent 410 377; Swiss Patent 682 798; DE  
44 29 353; 202 00 419; 20 2006 019 039; 2007 008 590; EP 1448084; 1676509;  
08155851. 2, Korean Patent No. 2 624 844, GB Patent No. 2 397 510, U.S. Pat. Nos.  
4,377,049, 4,458,735, 4,554,419, 4,767,632, 4,954,697, 5,312,020, 5,335,705, 5,372,061,  
5,375,508, 5,645,230, 5,685,435, 5,731,981, 5,836,236, 5,959,869, 6,182,555, 6,354,341,  
6,759,072, U.S. Patent Application Publication Nos. 2007/0157820, WO 97/25634, WO  
99/50172, WO 2004/030435, WO 2004/030438, WO 2006/063645, WO 2006/090183,  
WO 2007/008138, WO 2008/00838, WO 2007/00838, WO 2007/00838, WO  
2007/00838, WO 2007/00838, WO 2007/00838, WO 2008/00838, WO 2007/00838,  
WO 2007/00838, WO 2008/00838, WO 2008/00838, WO 2008/00838, WO

2008/00838, WO.

[0008]

*126* It is therefore a preferred object of the invention to improve at least one feature of a beverage machine interface selected from, for example, ergonomics, interactions, insensitivity, user friendly and simplicity of an interface of a coffee, chocolate, cocoa, milk, soup or tea preparation machine.

[0009]

*133* The present invention therefore relates to a beverage preparation machine.

*134* The machine may have a water supply source, a beverage preparation unit and an outlet for supplying the beverage to the beverage dispensing area.

[0010]

*139* For example, the machine is a machine for preparing beverages by passing hot or cold water, or another liquid, through a capsule comprising raw materials of the beverage to be prepared, such as coffee, tea, chocolate, cocoa, milk, and/or soup machines, for example ground coffee.

*143* Examples of such machines are disclosed in WO 2007/042415, WO 2007/042414, WO 2007/134960, WO 2009/074550, WO 2009/130099, WO 2013/127476 and the literature cited therein.

[0011]

*149* For example, a beverage machine has a container holding unit for preparing beverages from at least 1 raw material and dispensing such prepared beverages.

*151* For example, the machine is configured to prepare coffee, tea, chocolate, cocoa, milk, and/or soup.

*153* For example, the machine is configured to prepare a beverage by passing hot or cold water, or another liquid, through a container held in a beverage processing module comprising a container holding unit, such as a capsule to be held, comprising raw materials such as flavoring ingredients of the beverage to be prepared, such as ground coffee, tea, chocolate, cocoa, or milk powder.

[0012]

*161* Such beverage preparation typically comprises mixing a plurality of beverage ingredients, such as, for example, water and milk powder, and/or injecting beverage ingredients, such as infusion of ground coffee or water and tea.



- 164 For example, a predetermined amount of beverage corresponding to 1 minute is formed and dispensed according to a user's request.
- 166 Such a 1 dose amount may range from 25 to 250 mL (e.g., the amount to fill a cup or mug) depending on the type of beverage.
- 168 The beverage formed and dispensed may be selected from Listeria, espresso, lungo, cappuccino, caffelate, American coffee, tea, and the like.
- 170 For example, the coffee machine may be configured to dispense espresso (20-60 mL adjustable amount per 1 time) and/or dispense lungo (e.g., an amount in the range of 70-200 mL per time).

#### [0013]

- 176 In advantageous embodiments, the beverage machine is of the type that combines raw materials by centrifugal treatment as disclosed, for example, in WO 2008/148601, WO 2008/148604, WO 2008/148646, WO 2008/148650, WO 2008/148656, WO 2009/106175, WO 2009/106598, WO 2010/063644, WO 2010/066736, WO 2010/089329, WO 2011/023711, PCT/EP13/077276, and PCT/EP13/077275.
- 181 Thus, the machine may comprise a raw material mixing chamber for accommodating raw material capsules, for example, into which a liquid is injected and which undergoes a centrifugal process about a centrifugal axis to mix the raw material and the liquid.
- 184 The raw material mixing chamber can be opened and closed to rotate and mix the raw materials.

#### [0014]

- 189 The machine of the present invention includes a user interface having a generally peripheral illuminable device formed by the illuminable portion and extending around the inner portion and a control device for enabling and disabling illumination of the illuminable portion, such as a programmable control device.
- 193 For example, the control device includes a controller, such as a printed circuit board PCB and a controller connected to a PCB by a connector.
- 195 The PCB may be formed from a single printed circuit board or several juxtaposed or spaced printed circuit boards connected electrically, optically or otherwise.
- 197 Optionally, the control device controls other functions of such a machine, such as, for example, the IT module, pump, heat regulator, and/or power unit of the preparation unit.

#### [0015]

- 202 In typical embodiments, the user interface is on the top, or front, or side of such a machine.

#### [0016]

206 According to the invention, the control device has at least 1 setting in order to enable only a part of the illuminable part.

#### [0017]

211 The illuminable portion may include 1 or more spots, such as, for example, round spots or polygonal spots, arranged along a generally peripheral illuminable device and/or 1 or more elongated segments extending along a generally peripheral illuminable device.

214 Such elongate segments include segments that may be selected from curved segments, such as segments extending generally along a circular sector and/or segments extending generally along an elliptical sector; straight segments; angled segments; segments extending along the entire straight side of the perimeter illuminable device; angled segments extending along a plurality of straight sides of the perimeter illuminable device, such as segments extending along only 2 straight sides and/or along more than 3 sides of the perimeter illuminable device; and segments extending over a portion of the entire length of the perimeter illuminable device, which portion may be selected from segments that correspond to about half, or 1/3, or 1/4, or 1/5, or 1/6, or 1/7, or 1/8, or 1/9, or 1/10, or 1/12, or 1/4 of the entire length.

#### [0018]

227 The generally peripheral illuminable device may extend around a single inner portion or around some inner portion, such as a pair of inner portions, for example, such that the generally peripheral illuminable device is generally 8 shaped around and between spaced inner portions.

231 A single inner portion may be made from a plurality of portions, e.g., a plurality of valid interface portions, or a plurality of invalid interface portions, or a combination of at least 1 valid interface portion and at least 1 invalid interface portion.

234 For example, such a valid interface portion is in the form of a user selector.

235 The invalid user interface portion may be in the form of a portion of the housing.

236 A portion of the housing belongs to the housing of the interface and/or belongs to the external machine housing.

#### [0019]

241 The inner portion may be an active portion, such as a selector or a plurality of selectors, for example in the form of one or more push buttons, and/or a passive portion, such as a portion of a housing, for example.

#### [0020]

247 The generally peripheral illuminable device may comprise one or more of the following

features: a light diffusing window, such as a translucent window, for diffusing light emitted by the light emitting elements; a light transmitting window, such as a transparent window, for indicating the shape of the light emitting elements to a user; a plurality of light emitting elements, including a single color light emitting element or a different color light emitting element, such as a color selected from white, yellow, orange, red, green, blue, and pink, and mixtures thereof; each illuminable portion of the peripheral illuminable device, illuminable by a single color light emitting element or by a group of different color light emitting elements, wherein the light emitting elements of such a group are separately or group-enabled; and a light emitting element, such as an LED, optionally connected to the PCB or a PCB by a connector, such as a pair of connectors.

#### [0021]

- 261 Light emitting elements that emit light of different colors may be used to transmit signals of different types.
- 263 For example, red color may be used to communicate an indication of warning or an indication of heat generation.
- 265 The blue color may be used to communicate an indication associated with cold conditions.
- 266 Green may be used to indicate a state or a ready state.
- 267 Red or blue may be used to communicate an indication of the process of warming or cooling the beverage.
- 269 Orange or yellow may be used to indicate a user programming mode or a service mode, such as machine rinsing, cleaning, or descaling.
- 271 Thus, intuitive color codes may be used to communicate different indicators to the user.

#### [0022]

- 275 The illuminable portions of the generally circumferential illuminable device may be in a line configuration that is side-by-side around the inner portion, such as a curved and/or angled line configuration.
- 278 For example, the illuminable portions of the generally peripheral illuminable device are in a single side-by-side linear configuration, or in 2, 3, or 4 generally parallel or concentric side-by-side linear configurations, and/or in a side-by-side linear configuration, wherein 2 adjacent illuminable portions are directly adjacent to one another or spaced apart by spacers, such as a portion of a housing.

#### [0023]

- 286 The illumination of each illuminable portion may spread substantially over the entire portion.
- 287 Optionally, illumination of each portion results in a substantially uniform light intensity and/or a substantially uniform color throughout these portions.
- 289 The color may be selected from white, yellow, orange, red, green, blue, and pink, or a mixture

of several such colors.

[0024]

<sup>294</sup> The control device may have at least 1 setting for sequentially enabling successive portions, e.g. successive portions of a linear side-by-side configuration, in a rotational sequence about the inner portion, e.g.: a) at least 1 setting for sequentially enabling in a clockwise and subsequent counterclockwise sequence, or in a counterclockwise and subsequent clockwise sequence, b) at least 1 setting for sequentially enabling this repeatedly once or more once the rotational sequence is completed, and/or c) over the rotational sequence and/or between a plurality of successive rotational sequences, e.g., at least 1 setting for changing speed and sequentially enabling to indicate different steps: a beverage preparation procedure, e.g., a continuous pre-wetting and extraction step, and/or a service procedure, e.g., a continuous descaling procedure.

[0025]

<sup>307</sup> Such settings may be used to indicate the operation of the cycle at any time point, such as, for example, an activation cycle, or a beverage preparation cycle, or a cleaning cycle.

<sup>309</sup> In an advantageous embodiment, such a setting may be used to indicate a beverage preparation cycle by centrifugal processing, wherein the outer circumferential illuminable device optionally extends around a centrifugal processing axis, wherein the centrifugal processing is indicated by a rotational sequence, such as a plurality of iterations of a rotational sequence, indicating the centrifugal processing about the centrifugal processing axis.

[0026]

<sup>318</sup> The control device may have at least 1 setting for sequentially enabling successive portions in a rotational sequence about the inner portion and disabling all portions simultaneously after enabling all portions.

[0027]

<sup>324</sup> The control device may have at least 1 setting for sequentially disabling the previously enabled portion in the rotation sequence while sequentially enabling the successive portion in the rotation sequence about the inner portion.

<sup>327</sup> Optionally, these portions have different activation and deactivation rates, such as equal activation and deactivation rates, or activation rates that are faster than the deactivation rates.

<sup>330</sup> At least 2 or 3 portions may be simultaneously in the enabled state.

[0028]

<sup>334</sup> The control device may have at least 1 setting such that 1 part is intermittently enabled and disabled.

[0029]

<sup>339</sup> For example, such settings may be associated with an indication of an error or an indication confirming that the machine 1 has acquired information, such as confirming that the user instruction has been properly acquired by the user selector.

[0030]

<sup>345</sup> Portions, such as portions or groups of portions, spaced apart, e.g., approximately evenly spaced apart, by permanently enabled or disabled portions about the inner portion may be enabled and disabled simultaneously.

[0031]

<sup>351</sup> 2 of these parts may be alternately enabled and disabled, such as 2 parts are alternately enabled and disabled.

[0032]

<sup>356</sup> For example, such a setting may be associated with a user input by a user selector or an expectation by the machine 1 of another action by the user, for example.

[0033]

<sup>361</sup> The portions may be intermittently enabled and disabled at a constant frequency, for example, some portions may be intermittently enabled and disabled at a constant frequency.

[0034]

<sup>366</sup> In addition to any of the above settings, the controller may have at least 1 further setting to enable and disable the portion at a faster rate than the above settings.

[0035]

<sup>371</sup> For example, different speeds may be used to distinguish between the execution of different types of procedures.

<sup>373</sup> For example, execution of an activation or service (descaling) procedure may be indicated by

1 or more rotational sequences at a relatively slow speed, and a beverage preparation procedure may be indicated by 1 or more rotational sequences at a relatively fast speed.

[0036]

379 Different speeds may be implemented to distinguish between the execution of different procedures of the same type, such as for example different beverage preparation procedures of lungo or espresso coffee, or different service procedures, such as for example mild or intensive descaling procedures.

[0037]

386 In addition to the activatable and disableable portions, at least 1 portion may remain permanently activated or disabled in the above settings or further settings.

[0038]

391 The control device may have at least 1 setting, for example at least 1 part is sequentially enabled, such as a single part or a group of adjacent parts.

[0039]

396 The perimeter illuminable device extends generally along an elongated shape; a) forms a curve, such as, for example, 1 or more circles and/or ellipses, or portions thereof; b) forms a regular or irregular polygon, such as a triangle, e.g., a square, rectangle, trapezoid, or parallelogram, or portions thereof, such as a quadrangle, pentagon, hexagon, heptagon, octagon, dodecagon, nonagonal, dodecagon, or dodecagon; and/or c) forms a stripe shape and/or a separate element, such as a separate light emitting element, arranged generally along the elongated shape, such as an LED or a portion of a light-emitting optical fiber.

[0040]

406 For example, the control device may include a setting for sequentially enabling successive portions, for example, successive portions of a linear side-by-side configuration, in a rotation sequence about an inner portion, and optionally a setting of a type for simultaneously disabling all portions after enabling all portions, to indicate execution of an activation procedure, for example, activation of a heater, by the setting, such as a setting for sequentially enabling at least 1 portion, such as a single portion or a group of adjacent portions, to indicate execution of a beverage preparation procedure, for example, by a centrifugal process, such as a setting for sequentially enabling successive portions in a rotation sequence about an inner portion and simultaneously disabling all portions after all portions are enabled, or setting for sequentially disabling at least 1 or a setting for

sequentially disabling a previously enabled portion, such as a setting for sequentially disabling a user, such as a setting for sequentially disabling a setting for a setting for sequentially turning a user, such as a setting for sequentially disabling a setting for sequentially disabling a predetermined portion, such as a setting for sequentially turning a predetermined portion, such as a setting for sequentially turning a predetermined portion, such as a predetermined portion, such as

[0041]

426 The invention will now be described with reference to the schematic drawings.

[0042]

430 A round interface of a beverage preparation machine according to the invention is schematically illustrated.

432 FIG. 1 shows a horizontal cross-sectional view of the interface.

433 An enlarged cross-sectional view of the interface of FIGS. 1 and 1 a, taken along line A-A, is illustrated.

435 An enlarged cross-sectional view of the interface of FIGS. 1 and 1 a, taken along line B-B, is illustrated.

437 A variation of the interface of the machine according to the invention is illustrated.

438 The different interfaces of polygons are illustrated which may be installed in the machine according to the invention.

440 The different interfaces of polygons are illustrated which may be installed in the machine according to the invention.

442 The different interfaces of polygons are illustrated which may be installed in the machine according to the invention.

444 An example of a curved-shaped interface that can be installed in a machine according to the invention is shown.

446 A beverage preparation machine according to the invention is illustrated.

[0043]

450 FIGS. 1 to 5 illustrate different user interfaces 10, 20, 30, 40, 50 for a beverage preparation machine 1 according to the invention.

452 An embodiment of a beverage machine 1 comprising an interface 10 is shown in FIG. 6.

[0044]

456 The exemplary beverage preparation machine 1 may have a water supply source 2 and a beverage preparation unit 3.



458 The water supply source 2 may be a water tank.

459 Alternatively, the machine water supply may include a connector that can be directly connected to the urban water distribution system such that there is no need to manually refill any water tank of the beverage machine.

#### [0045]

465 The machine 1 may be configured to prepare hot or cold beverages.

466 The machine 1 may be configured to combine different raw materials, for example a liquid carrier such as water and/or milk, and one or more flavoring and/or texture ingredients (texturing agents), for example chocolate, cocoa, coffee, tea, milk, syrup, sugar, cream, emulsifier, dried or gel soup.

470 The raw materials may be combined by mixing or injecting them.

471 Suitable machines are disclosed in more detail, for example, in WO 2009/074550 and WO 2009/130099.

473 In an advantageous embodiment, the beverage machine 1 is of the type which combines raw materials by centrifugal treatment as disclosed, for example, in WO 2008/148601, WO 2008/148604, WO 2008/148646, WO 2008/148650, WO 2008/148656, WO 2009/106175, WO 2009/106598, WO 2010/063644, WO 2010/066736, WO 2010/089329, WO 2011/023711, PCT/EP13/077276 and PCT/EP13/077275.

478 Thus, the machine 1 may include a raw material mixing chamber 3 b (typically arranged in the machine 1 and shown in dotted lines in FIG. 6 ) for accommodating raw material capsules into which liquid is injected and which undergoes a centrifugal process about a centrifugal axis 3 a to mix the raw material and the liquid.

482 The raw material mixing chamber 3 b can be opened and closed (e.g., by turning or raising and lowering the upper portion 1 a by actuating the handle 1 a) and can be rotated to mix the raw materials.

#### [0046]

488 The beverage machine 1 typically has an outlet 3 a, which may be a single outlet or a double outlet.

490 The outlet 3 a may be configured to supply beverage to the dispensing region 4.

491 The dispensing region 4 may be configured to receive a container such as a glass, cup or mug.

492 The dispensing region may be of any type, for example as disclosed in EP 1867260 or WO 2009/074557.

#### [0047]

497 The beverage machine 1 comprises a user interface 10, which is illustrated in more detail in FIGS. 1, 1A and 1B.

499 Alternatively, the interface 10 can be replaced by any of the interfaces 10', 20, 30, 40, 50



illustrated in FIGS. 1 x-5 or variations thereof encompassed within the scope of the present invention.

[0048]

505 The user interfaces 10, 10', 20, 30, 40, 50 all comprise: a generally peripheral illuminable device 11, 11', 21, 31, 41, 51 formed by illuminable portions 11A, 11B, 11C, 11D, 11E, 11F, 11A', 11B', 11C', 11D', 11E', 11F', 11H', 21A, 21B, 21C, 21D, 21E, 21F, 21G, 31A, 31B, 31C, 31D, 31E, 31F, 41A, 41B, 51A, 51B, 51C, 51D, 51E, 51F, 51G, 51H, 51X, extending around the inner portions 110, 120, and a controller 105, such as a PCB, 100', and a controller 105 for enabling and disabling illumination of the illuminable portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X, for example a PCB.

[0049]

515 The control device 100, 105 may control other functional parts of such a machine 1, such as IT modules, pumps, heat regulators and/or power parts of the beverage preparation unit 3.

[0050]

520 In an exemplary embodiment, the user interface 10, 10', 20, 30, 40, 50 is on the top 1a, front 1b or side 1c of such a machine 1.

522 In FIG. 6, for example, the user interface 10 is provided on the upper portion 1 aof the machine 1.

[0051]

527 The control device 100, 105 may incorporate at least one setting, such as a programmed setting, to enable only a portion of the illuminable portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X.

[0052]

533 For example, as illustrated in FIG. 1 x, the illuminable portion may include 1 or more illuminable spots 11A'-11H', such as round or polygonal spots, arranged along a generally circumferential illuminable device 11'.

536 For example, as illustrated in FIGS. 1, 2, 3, 4, and 5, the illuminable portion may have one or more elongated segments 11A-11F, 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X extending along a generally circumferential illuminable device 11, 21, 31, 41, 51.

[0053]

542 Such elongated segments may be selected from curved segments 11A-11F, 51A-51X, straight segments 21A, 21C, 21E, 21F, 21G, 31B, 21C, 21D, 21E (FIGS. 2-4 ), angled segments 21B, 21D, 31A, 31G, 41A, 41B (FIGS. 2-4 ), straight segments 21A, 21B, 31A, 31A, 41A, 41B (FIGS. 2-4 ), straight segments 21A, 21B, 31A, 41A, 41B (FIGS. 2-4 ), straight segments extending along the entire circumference of the outer circumference of the illuminable device 21, 31, 41 (FIGS. 2 to 4 ), straight segments extending along the entire circumference of the outer circumference of the illuminable device 21, 31A, 31A, 41B, and/or straight segments that are 1/ or more, or straight segments that are 1/ or 1/ or 1/ or 1/ or 1/ or 1 (FIGS. 2 ), or straight segments that are 1/ or 1/ or 1/ or 1/ or 1 or 1 or 1/ or 1/ or 1 or 1 or 1 or 1

[0054]

555 The perimeter illuminable devices 11, 11', 21, 31, 41, 51 may extend around a single inner portion 110 (FIGS. 1-4 ), or a number of inner portions 110, 120.

557 For example, such an arrangement extends around the pair of inner portions 110, 120, for example, such that the outer perimeter illuminable device 51 is approximately 8 shaped (FIG. 5 ).

[0055]

563 The single inner portion 110 can be made from several portions, for example, a plurality of valid interface portions 110A, 110B, 110C, 110D (FIGS. 1 and 2 ), a plurality of invalid interface portions, or a combination of at least 1 valid interface portion 110E and at least 1 invalid interface portion 110F (FIG. 4 ), for example, the valid interface portion is in the form of a user selector and/or the invalid user interface portion is in the form of a portion of the housing.

[0056]

572 The inner portion may be selected from the active portion 110 and/or the passive portion 110F, 120, such as a portion of the housing, for example in the form of one or more push buttons, such as the selector 110E or the plurality of selectors 110A, 110B, 110C, 110D.

[0057]

578 The user selectors 110, 110A, 110B, 110C, 110D, 110E are typically connected to the controller 105 or PCB 100 and may be configured to start preparing beverages having some characteristics such as, for example, desired amounts and/or concentrations and/or tastes to be generated, or to receive user instructions such as instructions to perform service procedures such as, for example, rinsing or cleaning or descaling, or to turn the machine 1 on or off, or to enter a user programming mode.

584 The user selectors 110, 110A, 110B, 110C, 110D, 110E may be configured to receive only user instructions, or may be further configured to indicate information to the user, for example, and the user selector itself may comprise a light emitting device controlled by the controller 105.

588 For example, the user selector can be illuminated by whether a function associated with the selector is available at a predetermined point in time when the machine 1 is in use.

590 For example, it is not possible to initiate the beverage preparation process during the descaling process.

592 This can be indicated by appropriate illumination of the corresponding user selector.

593 This does not mean that the user cannot order the beverage during the service procedure, but rather means that the service procedure needs to be interrupted or executed until the end, and then executes the instructions for beverage preparation.

596 For example, the controller may store a particular user request for execution at a later point in time when the machine 1 is in a state capable of executing the user request.

598 For example, for an embodiment in which a stored user request is executed later, see, for example, WO 2011/020779.

600 Of course, it is also possible to configure the machine such that the input to perform a particular process is not accepted as long as such a process cannot be performed.

#### [0058]

605 The peripheral illuminable devices 11, 11', 21, 31, 41, 51 may include: a light diffusion window 111 (FIGS. 1, 1A, and 2B ), such as a translucent window, for diffusing light emitted by the light emitting elements 101, 102, 103, a light transmission window 111' (FIG. 2x ), such as a transparent window, for indicating the shape of the light emitting element 101' to a user, a plurality of light emitting elements 101, 101', 102, 103, including different color light emitting elements 101, 102A, 100B, 100C, 100D, 100E, 100F, or a different color light emitting element 101, 102B, 100C, 100D, 100E, 100F, such as a color selected from white, yellow, orange, red, green, blue, pink, and mixtures thereof, and a connector 100A, 100B, 100C, 100D, 100E, 100F, such as a group of light emitting elements 101, 100A, 100A, 100A, 100A, or a connector 100A, 51A, or a connector 100A, 51B, or a connector 100A, 51B, or a connector 100A, 51B, or a connector

#### [0059]

619 The illuminatable portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X of the outer circumferential illuminatable devices 11, 11', 21, 31, 41, 51 may be in a line-like configuration that is side-by-side around the inner portion 110, 120, such as a curved configuration (FIGS. 1-1x and 5 ) and/or an angled line-like configuration (FIGS. 2-4 ).

623 Such illuminable portions may be in a single side-by-side linear configuration 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X (FIGS. 1-5 ), or 2, young 3, or 4 generally parallel side-by-side linear configurations, and/or in 11A-11F, 11A'-11H', 21A-21G, 31A-31F,

41A-41B, 51A-51H, 51X (FIGS. 1, 2, 3, 4, and 5 ), or 11A'-11H' (FIG. 1 x ), side-by-side linear configurations 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X, which are directly adjacent to one another.

#### [0060]

<sup>632</sup> The illumination of the illumination portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X may spread substantially across these portions.

<sup>634</sup> Optionally, the illumination of such portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X results in a substantially uniform light intensity and/or a substantially uniform color, such as a color selected from white, yellow, orange, red, green, blue, and pink, or a color resulting from a mixture of several such colors, throughout these portions.

#### [0061]

<sup>641</sup> The control device 100, 105 may have at least 1 setting for sequentially enabling successive portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X, e.g. successive portions of a linear side-by-side configuration, in a rotational sequence about the inner portion 110, 120.

<sup>645</sup> Optionally, the speed is changed and sequentially validated to indicate different steps: a) in a clockwise and subsequent counterclockwise sequence, or in a counterclockwise and subsequent clockwise sequence; b) when the rotation sequence is completed, this is repeatedly and sequentially validated one or more times; and/or c) over the rotation sequence and/or between a plurality of consecutive rotation sequences: a continuous beverage preparation procedure, e.g., pre-wetting and extraction; and/or a continuous service procedure, e.g., descaling procedure.

#### [0062]

<sup>655</sup> Such settings may be used to indicate the operation of the cycle at any time point, such as, for example, an activation cycle, or a beverage preparation cycle, or a cleaning cycle.

<sup>657</sup> In an advantageous embodiment, such a setting may be used to indicate a beverage preparation cycle by centrifugal processing, wherein the outer circumferential illuminable device optionally extends around the centrifugal processing axis 3 a, wherein the centrifugal processing is indicated by a rotational sequence, such as a plurality of iterations of a rotational sequence, indicating the centrifugal processing about the centrifugal processing axis 3 a.

#### [0063]

<sup>666</sup> The control device 100, 105 may have at least 1 setting for sequentially enabling the successive portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X in a

rotational sequence about the inner portions 110, 120 and simultaneously disabling all portions after enabling all portions.

[0064]

673 The control device 100, 105 may have at least one setting for sequentially enabling the successive portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X in a rotational sequence about the inner portions 110, 120 while sequentially disabling the previously enabled portions in a rotational sequence.

677 The portion may have different activation and deactivation rates, such as equal activation and deactivation rates, or activation rates that are faster than the deactivation rates.

679 At least 2 or 3 portions may be simultaneously in the enabled state.

[0065]

683 The control device 100, 105 may have at least 1 setting in which 1 part, 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X, is intermittently enabled and disabled.

[0066]

688 For example, such settings may be associated with an indication of an error or an indication confirming that the machine 1 has acquired information, such as confirming that the user instruction has been properly acquired by the user selector.

[0067]

694 The plurality of such portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X may be enabled and disabled simultaneously.

696 For example, portions, or groups of portions, are spaced apart by other permanently enabled or disabled portions about the inner portions 110, 120.

698 Such parts, or groups of parts, are equally spaced about the inner portions 110, 120, for example.

[0068]

703 2 of such portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X may be alternately enabled and disabled.

[0069]

708 For example, 2 parts are alternately enabled and disabled.

[0070]

<sup>712</sup> For example, such a setting may be associated with a user input by a user selector or an expectation by the machine 1 of another action by the user, for example.

[0071]

<sup>717</sup> Such portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X may be intermittently enabled and disabled at a constant frequency.

<sup>719</sup> For example, some portions are intermittently enabled and disabled at a constant frequency.

[0072]

<sup>723</sup> In addition to such settings, the controller 100, 105 may have at least 1 other setting for enabling and disabling the portions 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X at a faster rate than the above settings.

[0073]

<sup>729</sup> For example, different speeds may be used to distinguish between the execution of different types of procedures.

<sup>731</sup> For example, execution of an activation or service (e.g., descaling) procedure may be indicated by 1 or more rotational sequences at a relatively slow speed, and a beverage preparation procedure may be indicated by 1 or more rotational sequences at a relatively fast speed.

[0074]

<sup>737</sup> For example, different speeds may be implemented to distinguish different service procedure runs, such as different beverage preparation procedures of, for example, lungo or espresso coffee, or mild or intensive descaling procedures.

[0075]

<sup>743</sup> In addition to the activatable and disableable portions, at least 1 portion may remain permanently activated or disabled in the above configuration or in the above further configuration.

[0076]

<sup>749</sup> For example, a non-stop warning may be indicated by the permanently active portion, such as raw material (e.g., water) availability approaching a minimum level.

<sup>751</sup> Another example of a non-stop alert may relate to the need to perform a service (e.g.,

descaling) process within a short time.

[0077]

<sup>756</sup> The control device 100, 105 may have at least 1 setting, for example, at least 1 part being sequentially enabled, such as a single part 11A-11F, 11A'-11H', 21A-21G, 31A-31F, 41A-41B, 51A-51H, 51X, or a group of adjacent parts.

[0078]

<sup>762</sup> The perimeter illuminable devices 11, 11', 21, 31, 41, 51 are generally along an elongated shape, a combination of at least one feature a, such as: a) forming a curve 11, 11', such as, for example, 1 or more circles 11, 11' (FIGS. 1, 1a, and 1x) and/or ellipses 51 (FIG. 5 ), or a portion thereof; b) forming a triangle 41 (FIG. 4 ), such as, for example, a square 31 (FIG. 3 ), a rectangle, a trapezoid, or a parallelogram, such as a square 31, a pentagon, a hexagon 21 (FIG. 2 ), a heptagon, an octagon 11' (FIG. 1x), a pentagon, a nonagon, a dodecagon, a dodecagon, or a dodecagon; c) forming a regular or irregular polygon 21, 31, 41, or a portion thereof, such as a stripe 11, 21, 31, 41, 51 (FIGS. 1, 2-5 ) and/or a separate element 11' (FIG. 1x), such as a separate light emitting element, disposed generally along an elongated shape, such as, for example, an LED 101' or a portion of

[0079]

<sup>775</sup> For example, the control device 100, 105 may include a standby procedure for presenting an indication of the time required until preparation of beverage preparation by the above setting, such as a setting for sequentially enabling successive portions, for example, successive portions of a linear side-by-side configuration, in a rotation sequence about the inner portion, and optionally a setting of a type for simultaneously disabling all portions after enabling all portions, such as a setting for sequentially enabling at least 1 portion, such as a single portion or a group of adjacent portions, to indicate a standby procedure for presenting an indication of the time required until preparation of beverage preparation by the above setting, such as a setting for sequentially enabling successive portions in a rotation sequence about the inner portion and simultaneously disabling all portions after all portions are enabled, or a setting for sequentially disabling at least 1A to 11 or a setting for intermittently disabling at least 1A to 11 or a setting for sequentially disabling at least 1A to 11 or a setting for intermittently disabling at least 1A to 11 or a setting for selectively disabling at least 1A to 11 or a setting for intermittently disabling at least 1



## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference LIMA-PCT	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/GB2021/050764	International filing date ( <i>day/month/year</i> ) 26 March 2021 (26-03-2021)	(Earliest) Priority Date ( <i>day/month/year</i> ) 26 March 2020 (26-03-2020)
Applicant  CHIARO TECHNOLOGY LIMITED		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☒

It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

☒

the international application in the language in which it was filed

☐

a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐

This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6**bis**(a)).

c. ☐

With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.

☒

**Certain claims were found unsearchable** (See Box No. II)

3.

☐

**Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

☒

the text is approved as submitted by the applicant

☐

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒

the text is approved as submitted by the applicant

☐

the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

☒

as suggested by the applicant

☐

as selected by this Authority, because the applicant failed to suggest a figure

☐

as selected by this Authority, because this figure better characterizes the invention

b. ☐

none of the figures is to be published with the abstract



International application No.  
PCT/GB2021/050764**INTERNATIONAL SEARCH REPORT****Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 11-85  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
  
see FURTHER INFORMATION sheet PCT/ISA/210
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2021/050764

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M1/06

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/007561 A1 (NAYA HEALTH INC [US]) 14 January 2016 (2016-01-14) paragraphs [0047] - [0070]; figures 3-7, 16-18	1-10
X	US 2018/104396 A1 (PARK CHO HEE [KR]) 19 April 2018 (2018-04-19) paragraphs [0037] - [0061]; figures 1-8	1



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents :

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier application or patent but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*Z\* document member of the same patent family

Date of the actual completion of the international search

27 June 2021

Date of mailing of the international search report

06/07/2021

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
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Authorized officer

Schlaug, Martin

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2021/050764

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016007561 A1	14-01-2016	AU 2015287927 A1	02-02-2017
		AU 2020202382 A1	30-04-2020
		CN 106687155 A	17-05-2017
		EP 3166657 A1	17-05-2017
		US 2020246517 A1	06-08-2020
		WO 2016007561 A1	14-01-2016
-----			
US 2018104396 A1	19-04-2018	CN 107206135 A	26-09-2017
		KR 101622768 B1	19-05-2016
		US 2018104396 A1	19-04-2018
		WO 2016186452 A1	24-11-2016
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

Continuation of Box II.2

Claims Nos.: 11-85

The present application contains 85 claims, 14 of which are independent. There is no clear distinction between the independent claims because of their overlapping scope. In view of the (excessive) number of claims and of their formulation, the claims as a whole do not satisfy the requirements of conciseness and clarity of Art. 6 PCT. Furthermore, the application does not meet the requirements of unity of invention laid down in Rule 13.1 PCT and, prima facie, it appears to relate to 9 separate inventions.

In the present case it is particularly burdensome for a skilled person to establish the subject-matter for which protection is sought. Although all claims relate in one way or another to breast pump systems or components thereof, they define so many different aspects and details of the system and its parts that it results unduly burdensome to determine the matter for which protection is sought.

The non-compliance with the substantive provisions is to such an extent, that a meaningful search of the whole claimed subject-matter cannot be carried out (Art. 17(2) PCT and PCT Guidelines 9.30).

Furthermore, the description contains so many different embodiments that no reasonable basis can be found in the application that clearly indicates the subject-matter which might be expected to form the subject of the claims later in the procedure.

The applicant was invited by this International Searching Authority to provide informal clarification on the issue indicated above, but has not responded to this invitation within the given time limit. Therefore the search has been limited to claims 1-10 as indicated in the formal invitation for clarification.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) PCT declaration be overcome.

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	17181057			
<b>Filing Date:</b>	22-Feb-2021			
<b>Title of Invention:</b>	BREAST PUMP SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE			
<b>Filer:</b>	Yangbeini Wang/Jon Baitlon			
<b>Attorney Docket Number:</b>	4944.0120006			
Filed as Small Entity				
<b>Filing Fees for Utility under 35 USC 111(a)</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
RCE- 1ST REQUEST	2801	1	544	544
<b>Total in USD (\$)</b>				<b>544</b>

**Electronic Acknowledgement Receipt**

<b>EFS ID:</b>	47435211
<b>Application Number:</b>	17181057
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	4690
<b>Title of Invention:</b>	BREAST PUMP SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Jonathan O'TOOLE
<b>Customer Number:</b>	26111
<b>Filer:</b>	Yangbeini Wang/Kim Perry
<b>Filer Authorized By:</b>	Yangbeini Wang
<b>Attorney Docket Number:</b>	4944.0120006
<b>Receipt Date:</b>	26-JAN-2023
<b>Filing Date:</b>	22-FEB-2021
<b>Time Stamp:</b>	17:56:23
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$544
RAM confirmation Number	E20231PH56561609
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	2023-01-26-Transmittal-Form-4944-0120006.pdf	167793	no	1
			8eab88c1da94fa5b396c752a49d654968836b2c5		

**Warnings:****Information:**

2		2023-01-26-Amendment-Reply-114-4944-0120006.pdf	165348	yes	12
			ec793e86b9f242361253d7811783a105d4276ea8		

**Multipart Description/PDF files in .zip description**

Document Description		Start	End
Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)		1	1
Claims		2	6
Applicant Arguments/Remarks Made in an Amendment		7	12

**Warnings:****Information:**

3	Transmittal Letter	2023-01-26-sIDS-Pleading-4944-0120006.pdf	118197	no	2
			5634749b38b0c29022d1ba8d08a19a2e95fac853		

**Warnings:****Information:**

4	Information Disclosure Statement (IDS) Form (SB08)	2022-01-26-sIDS-Form-SB08-4944-0120006.pdf	203675	no	4
			ec1b53148b4ba29e7d00efa80c774326fcb225ff		

**Warnings:****Information:**

This is not an USPTO supplied IDS fillable form



Case 2:23-cv-00631-KKE Document 136-9 Filed 12/11/24 Page 803 of 1121

5	Request for Continued Examination (RCE)	2023-01-26-RCE-4944-0120006.PDF	1349977  433b81065eabca7431344a3cbb28c8fb230e31c4	no	3
Warnings:					
Information:					
6	Foreign Reference	FP1_JP2013545519A-4944-0120006.PDF	985411  733b34af523197e67bb578e5ba232924adc39c7	no	59
Warnings:					
Information:					
7	Foreign Reference	FP2_JP2016524490A-4944-0120006.PDF	846613  c48f79665938f2f6fb35c4e14f5a827b70364e9a	no	43
Warnings:					
Information:					
8	Foreign Reference	FP3_WO2013064852A1-4944-0120006.PDF	1417100  3de7ad793b01dd9549292d9acb468550544c146b	no	148
Warnings:					
Information:					
9	Foreign Reference	FP4_JP2014532498A-4944-0120006.PDF	2524601  422967c9c33e52254ab3f30a009523003e5ad773	no	125
Warnings:					
Information:					
10	Foreign Reference	FP5_WO2016006458A1-4944-0120006.PDF	432120  a5a702fef4da6c9ac0ac4807025d4325f67aa5b9	no	36
Warnings:					
Information:					
11	Foreign Reference	FP6_JPH11178917A-4944-0120006.PDF	403589  d58a68b87c92a3048b9e734c89425c13403155a5	no	15
Warnings:					
Information:					

Case 2:23-cv-00631-KKE Document 136-9 Filed 12/11/24 Page 804 of 1121

12	Foreign Reference	FP7_JP2000350527A-4944-0120006.PDF	511735  6a14725ef694fd7c556d6f69e87253027563bb5e	no	19
Warnings:					
Information:					
13	Foreign Reference	FP8_WO2016007561A1-4944-0120006.PDF	752974  c19726eb92c8598893266af5a3de342850226d7d	no	44
Warnings:					
Information:					
14	Foreign Reference	FP9_WO2016025405A1-4944-0120006.PDF	808719  4462946e981bddb5cab26008cc9e451236e02323	no	41
Warnings:					
Information:					
15	Foreign Reference	FP10_WO2004108184A2-4944-0120006.PDF	1650019  7821a8c9b8e0ce59bc167dc20b17b9a7ee315fea	no	58
Warnings:					
Information:					
16	Foreign Reference	FP11_JP2016526396A-4944-0120006.PDF	437026  b2c5d4292a1e7596dc75f4855ac6c0f938e6a03d	no	38
Warnings:					
Information:					
17	Foreign Reference	FP12_WO2014160614A1-4944-0120006.PDF	499411  0dea128c97e27bf073109128ad2ebe10898a21c8	no	34
Warnings:					
Information:					
18	Foreign Reference	FP13_JP2017503552A-4944-0120006.PDF	562118  f693f414124512e7a5aef6e2b3074332f7942c8c	no	45
Warnings:					
Information:					

19	Non Patent Literature	NPL1_ISR-4944-0120006.PDF	63565 cc12cc9b97dcb3ae51dade8d1b875bed8631dc19	no	5
<b>Warnings:</b>					
<b>Information:</b>					
20	Non Patent Literature	NPL2_JPSR-4944-0120006.PDF	311182 62560011fd8730f154e63e8fc5f2cd0d3909ed9a	no	20
<b>Warnings:</b>					
<b>Information:</b>					
21	Non Patent Literature	NPL3_EESR-4944-0120006.PDF	381670 e5873042c412e45b83ff6fbd0daa359396b51381	no	26
<b>Warnings:</b>					
<b>Information:</b>					
22	Fee Worksheet (SB06)	fee-info.pdf	37660 2b259eeefb80a049929525106b5b8cb13c536d12	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>					14630503
<p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDRICKSON, Courtney B.
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Request for Continued Examination Transmittal (PTO/SB/30EFS); FP1-FP13 and NPL1-3.
<b>Remarks</b> Online Credit Card Authorization for \$544.00 to cover the RCE Fee (1st request).  The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Richard D. Collier III/		
Printed name	Richard D. Collier III		
Date	January 26, 2023	Reg. No.	60,390

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: O'TOOLE et al.

Applicant: Chiaro Technology Limited

Application No.: 17/181,057

Filing Date: February 22, 2021

Title: **BREAST PUMP SYSTEM**

Confirmation No.: 4690

Art Unit: 3783

Examiner: FREDRICKSON, Courtney B.

Atty. Docket: 4944.0120006

**Amendment and Reply Under 37 C.F.R. § 1.114**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

*Mail Stop RCE*

Commissioner:

In reply to the Office Action dated October 26, 2022, Applicant submits the following amendment and remarks.

If extensions of time are necessary to prevent abandonment of this application, then they are petitioned for under 37 C.F.R. § 1.136(a). Any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

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October 26, 2022

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### *Amendments to the Claims*

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently amended) A breast pump device comprising:  
    ~~a self-contained, in-bra wearable device comprising:~~  
    a housing comprising:  
        a battery, and  
        a pump configured to generate negative air pressure;  
    a breast shield of a plurality of interchangeable breast shields, each of the plurality of interchangeable breast shields having a different size and being configured to slide in and out of the housing, the breast shield comprising a breast flange and a nipple tunnel comprising a side wall and a front end, and a guide line, wherein the breast shield is transparent or optically clear; and  
    a milk container configured to be attached to and removed from the housing,  
    wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast, and  
    wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.
2. (Canceled)
3. (Previously presented) The breast pump device of claim 1, wherein the breast shield is rigid.
4. (Previously presented) The breast pump device of claim 1, wherein the breast shield is a dishwasher safe, plastic breast shield.
5. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to be attached using magnets to the housing.

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Chiaro Technology Limited  
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6. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast.
7. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to present, in use, a single continuous surface to a nipple and a breast.
8. (Previously presented) The breast pump device of claim 1, wherein the breast flange and the nipple tunnel are integrally formed.
9. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to be generally symmetrical about a center-line running from a top to a bottom of the breast shield when positioned upright for normal use.
10. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to slide into the housing with a single push action.
11. (Previously presented) The breast pump device of claim 1, wherein the breast shield is configured to slide out from the housing, together with a membrane that is configured to prevent milk from flowing into the pump.
12. (Previously presented) The breast pump device of claim 1, wherein the milk container is rigid.
13. (Previously presented) The breast pump device of claim 1, wherein the milk container is an optically clear, dishwasher safe, plastic milk container.
14. (Previously presented) The breast pump device of claim 1, wherein the milk container is configured to attach to a lower part of the housing and forms a base of the breast pump device.

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15. (Previously presented) The breast pump device of claim 1, wherein the milk container is configured to magnetically attach to the housing.
16. (Currently amended) The breast pump device of claim 1, wherein the ~~nipple tunnel~~ comprises guide line[s] is configured to run parallel along one or more sides of the nipple tunnel.
17. (Previously presented) The breast pump device of claim 1, wherein the nipple tunnel comprises an air hole or passage, and wherein the pump is configured to transfer negative air pressure into the nipple tunnel via the air hole or passage.
18. (Previously presented) The breast pump device of claim 1, wherein the nipple tunnel comprises on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container.
19. (Previously presented) The breast pump device of claim 1, wherein the pump comprises one or more piezo air pumps.
20. (Previously presented) The breast pump device of claim 1, wherein the housing further comprises a Universal Serial Bus (USB) charging socket.
21. (Previously presented) The breast pump device of claim 1, wherein the housing comprises a left or right breast selector or toggle switch that, when selected for a particular pumping session, is configured to send data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast.
22. (Previously presented) The breast pump device of claim 1, wherein the housing is configured to be shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra.
23. (Canceled)



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24. (Previously presented) The breast pump device of claim 1, wherein the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg.
25. (Previously presented) The breast pump device of claim 1, wherein the breast pump device comprises a sensor that is configured to directly measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.
26. (Canceled)
27. (Canceled)
28. (Previously presented) The breast pump device of claim 1, wherein the pump is configured to deliver in excess of 400 mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.
29. (Previously presented) The breast pump device of claim 1, wherein the pump is a lightweight air pump that enables a total mass of the breast pump device, unfilled with milk, to be less than 250 gm.
30. (Previously presented) The breast pump device of claim 1, wherein the breast pump device is configured to make less than 30 dB noise at maximum power and less than 25 dB at normal power, against a 20 dB ambient noise.
31. (Previously presented) A kit, comprising:
  - the breast pump device of claim 1; and
  - the plurality of interchangeable breast shields.
32. (Previously presented) The kit of claim 31, wherein each of the plurality of interchangeable breast shields comprises fit lines in a nipple tunnel of that breast shield that are configured to

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enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.

33. (Previously presented) The breast pump device of claim 1, wherein the battery is a rechargeable battery, and wherein the housing further comprises:
- a power charging circuit configured to control the charging of the rechargeable battery, and
  - control electronics configured to be powered by the rechargeable battery.
34. (Currently amended) The breast pump device of claim 1, wherein a length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same.

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### ***Remarks***

Upon entry of the foregoing amendment claims 1, 3–22, 24–25, and 28–34 are pending in the application. Claim 1 is an independent claim. Claims 1, 16, and 34 are amended. Claim 2 is canceled without prejudice or disclaimer. These changes do not introduce any new matter, and Applicant respectfully requests their entry.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Office reconsider and withdraw all outstanding objections and rejections.

### ***Allowable Subject Matter***

The Office indicates claim 28 is allowable over the prior art of record excepting the double patenting rejection of the same. (Office Action dated October 26, 2022, p. 42.) Applicant appreciates the Office’s indication that claim 28 would be allowable if the double patenting rejection of the same is overcome. (*Id.*) For at least the reasons discussed below, all pending claims are allowable over the cited art.

### ***Claim Objection***

The Office objects to claim 34 for an alleged informality. (*Id.*, 2.) Without acquiescing to the propriety of the objection and solely to expedite prosecution, claim 34 is amended.

Applicant asks the Office to withdraw the objection to claim 34.

### ***Rejections under 35 U.S.C. § 103***

#### **Independent Claim 1 (Myers, Cook)**

The Office rejects claims 1, 3, 6–8, 10–11, 14, 16–18, 22, 24, 31, and 34 under 35 U.S.C. § 103 as allegedly obvious over U.S. Publication No. 2008/0275386 to Myers in view of EP Publication No. 2502640 to Cook *et al.* (*Id.*, 3.)

Without acquiescing to the propriety of the objection and solely to expedite prosecution, claim 1 is amended to recite, in part, “a breast shield of a plurality of interchangeable breast shields ... the breast shield comprising ... a guide line ... wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast,

Atty. Dkt. No. 4944.0120006

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wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.”

The Office acknowledges that Myers does not teach or disclose “the breast shield being of a plurality of interchangeable breast shields,” “the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.” (*Id.*, 4–5.) Instead, the Office relies on Cook. (*Id.*, 5 (citing Cook, ¶ [0042], FIGS. 1A, 1B, refs. 9, 10, 11, 12).) However, both Myers and Cook fail to disclose or suggest at least the claimed guide line of the breast shield “configured to define the spacing of the nipple from the side wall of the nipple tunnel.” (*See* Cook, ¶¶ [0042], [0044], FIGS. 2A, 2B.) Cook fails to disclose or suggest how, if at all, the dimensions of its varied diameters of apertures 10, 12 are communicated to a user. (*See id.*)

Accordingly, Myers and Cook, alone or in combination, fail to disclose or suggest these claimed features.

Applicant asks the Office to withdraw the § 103 rejections of claims 1, 3, 6–8, 10–11, 14, 16–18, 22, 24, 31, and 34.

#### Independent Claim 1 (Khalil, Myers, Cook)

The Office rejects claims 1, 6–10, 14, 17–18, 22, 31, and 34 under 35 U.S.C. § 103 as allegedly obvious over U.S. Publication No. 2013/0023821 to Khalil *et al.* in view of Myers and Cook.<sup>1</sup> (Office Action dated October 26, 2022, p. 8.)

As discussed above, claim 1 recites, in part, “a breast shield of a plurality of interchangeable breast shields ... the breast shield comprising ... a guide line ... wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.”

The Office acknowledges that Khalil does not teach or disclose the breast shield “being of a plurality of interchangeable breast shields each having a different size, the plurality of

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<sup>1</sup> The Office refers to claims 20-21 in this rejection. (*Id.*) However, the rejections of these claims over Khalil, Myers, and Cook are not explained. Applicant believes these claims were referred to in this rejection by mistake and responds accordingly.

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interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast.” (*Id.*, 9–10.) The Office relies on Cook to remedy this deficiency in Khalil. (*Id.*, 10 (citing Cook, ¶ [0042], FIGS. 1A, 1B, refs. 9, 10, 11, 12).) But Cook fails to disclose or suggest at least the claimed guide line of the breast shield “configured to define the spacing of the nipple from the side wall of the nipple tunnel,” as discussed above. (*See* Cook, ¶¶ [0042], [0044], FIGS. 2A, 2B.) Khalil and Myers are also deficient.

Accordingly, Khalil, Myers, and Cook, alone or in combination, fail to disclose or suggest these claimed features.

Applicant asks the Office to withdraw the § 103 rejections of claims 1, 6–10, 14, 17–18, 22, 31, and 34.

#### Remaining Claims

The Office rejects claim 4 under 35 U.S.C. § 103 as allegedly obvious over Myers in view of Cook, in view of U.S. Publication No. 2016/0296682 to Phillips *et al.*, and U.S. Publication No. 2005/0228342 to Yuen. (*Id.*, 8.) Claim 4 depends from and adds features to independent claim 1. Phillips and Yuen do not overcome the deficiencies discussed above. Accordingly, claim 4 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 4.

The Office rejects claim 5 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2018/0333523 to Chang *et al.* (*Id.*, 13.) Claim 5 depends from and adds features to independent claim 1. Chang does not overcome the deficiencies discussed above. Accordingly, claim 5 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 5.

The Office rejects claims 12–13 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and Phillips. (*Id.*, 14.) Claims 12–13 depend from and add features to independent claim 1. Phillips does not overcome the deficiencies discussed above. Accordingly, claims 12–13 are allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claims 12–13.

The Office rejects claim 15 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2007/0228059 to Karsan. (*Id.*, 15.) Claim 15 depends

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October 26, 2022

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Chiaro Technology Limited  
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from and adds features to independent claim 1. Karsan does not overcome the deficiencies discussed above. Accordingly, claim 15 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 15.

The Office rejects claim 19 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2012/0277636 to Blondheim *et al.* (*Id.*, 16.) Claim 19 depends from and adds features to independent claim 1. Blondheim does not overcome the deficiencies discussed above. Accordingly, claim 19 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 19.

The Office rejects claims 20–21 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2014/0378895 to Barack.<sup>2</sup> (*Id.*, 17.) Claims 20–21 depend from and add features to independent claim 1. Barack does not overcome the deficiencies discussed above. Accordingly, claims 20–21 are allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claims 20–21.

The Office rejects claim 25 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2016/0220743 to Guthrie *et al.* (*Id.*, 18.) Claim 25 depends from and adds features to independent claim 1. Guthrie does not overcome the deficiencies discussed above. Accordingly, claim 25 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 25.

The Office rejects claim 29 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Patent No. 6,227,936 to Mendoza. (*Id.*, 19.) Claim 29 depends from and adds features to independent claim 1. Mendoza does not overcome the deficiencies discussed above. Accordingly, claim 29 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 29.

The Office rejects claim 30 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2009/0281485 to Baker *et al.* (*Id.*, 20.) Claim 30 depends from and adds features to independent claim 1. Baker does not overcome the deficiencies discussed

---

<sup>2</sup> The Office Action appears to refer to the Barack publication as “Barak.” (*Id.*) Applicant refers to this publication as “Barack” herein.

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above. Accordingly, claim 30 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 30.

The Office rejects claim 32 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Publication No. 2012/0165729 to Cudworth. (*Id.*) Claim 32 depends from and adds features to independent claim 1. Cudworth does not overcome the deficiencies discussed above. Accordingly, claim 32 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 32.

The Office rejects claim 33 under 35 U.S.C. § 103 as allegedly obvious over Khalil in view of Myers, Cook, and U.S. Patent No. 5,542,921 to Meyers *et al.* (*Id.*, 21.) Claim 33 depends from and adds features to independent claim 1. Meyers does not overcome the deficiencies discussed above. Accordingly, claim 33 is allowable for at least the reasons that independent claim 1 is allowable. Applicant asks the Office to withdraw the § 103 rejection of claim 33.

### ***Double Patenting Rejection***

The Office rejects claims 1, 3–22, 24–25, and 29–34 on the grounds of non-statutory obviousness type double patenting as allegedly obvious over claim 1 of U.S. Patent No. 10,881,766 in view of Myers, Cook, Philips, Chang, Khalil, Karsan, Blondheim, Barack, Guthrie, Mendoza, Baker, Cudworth, and Meyers. (*Id.*, 23–27.) The Office rejects claims 1, 3–22, 24–25, and 28–34 on the grounds of non-statutory obviousness type double patenting as allegedly obvious over claim 1 of U.S. Patent No. 10,926,011 in view of Khalil, Myers, Cook, Philips, Chang, Khalil, Karsan, Blondheim, Barack, Guthrie, Mendoza, Baker, Cudworth, and Meyers. (*Id.*, 27–31.) The Office rejects claims 1, 3–22, 24–25, and 29–34 on the grounds of non-statutory obviousness type double patenting as obvious over claim 1 of U.S. Patent Nos. 11,357,893, 11,376,352, 11,357,894, 11,324,866, and 11,413,380, in view of Khalil, Myers, Cook, Philips, Chang, Khalil, Karsan, Blondheim, Barack, Guthrie, Mendoza, Baker, Cudworth, and Meyers. (*Id.*, 31–35.) The Office rejects claims 1, 3–22, 24–25, and 28–34 on the grounds of non-statutory obviousness type double patenting as allegedly obvious over claim 1 of U.S. Patent Nos. 11,260,151 and 11,311,654 in view of Khalil, Myers, Cook, Philips, Chang, Khalil, Karsan, Blondheim, Barack, Guthrie, Mendoza, Baker, Cudworth, and Meyers. (*Id.*, 35–38.) The Office rejects claims 1, 3–22, 24–25, and 29–34 are rejected on the grounds of non-statutory obviousness type double patenting as obvious over claims of U.S. Application Nos. 17/203,150, 17/203,179, 17/203,292, 17/203,355, 17/203,384,

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17/203,397, and 17/203,418 in view of Khalil, Myers, Cook, Philips, Chang, Khalil, Karsan, Blondheim, Barack, Guthrie, Mendoza, Baker, Cudworth, and Meyers. (*Id.*, 38–42.)

Applicant respectfully requests that the remaining currently asserted double patenting rejections be held in abeyance until the claimed subject matter is otherwise deemed allowable. After analyzing the final allowed claim scope, Applicant will consider filing a terminal disclaimer if necessary to overcome any obviousness-type double patenting rejections.

### ***Conclusion***

All grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Office reconsider and withdraw them. A complete reply has been made to the outstanding Office Action. As such, the present application is in condition for allowance. If the Office believes, for any reason, that personal communication will expedite prosecution of this application, the Office is invited to telephone the undersigned at the number provided. Applicant respectfully requests prompt and favorable consideration of this amendment and reply.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Richard D. Collier III  
Attorney for Applicant  
Registration No. 60,390

Date: January 26, 2023

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Atty. Dkt. No. 4944.0120006



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: Chiaro Technology Limited

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, Courtney B.

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop RCE*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(b) and is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as

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Chiaro Technology Limited  
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set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

Copies of documents **FP1-FP13** and **NPL1-NPL3** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018 (now U.S. Patent No. 10,926,022), in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Richard D. Collier III  
Attorney for Applicant  
Registration No. 60,390

Date: January 26, 2023

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Atty. Dkt. No. 4944.0120006

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875				Application or Docket Number 17/181,057		Filing Date 02/22/2021		<input type="checkbox"/> To be Mailed	
ENTITY: <input type="checkbox"/> LARGE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> MICRO									
<b>APPLICATION AS FILED - PART I</b>									
		(Column 1)			(Column 2)				
FOR		NUMBER FILED			NUMBER EXTRA			RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A			N/A			N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A			N/A			N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A			N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *						x \$50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *						x \$240 =	
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
<b>APPLICATION AS AMENDED - PART II</b>									
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT	01/26/2023	CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0			x \$40 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0			x \$192 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))								
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
								TOTAL ADD'L FEE	0
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=			x \$0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=			x \$0 =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))								
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
								TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.								LIE	
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/NICOLE L NICHOLSON/	
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690
26111	7590	03/30/2023		
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.			EXAMINER	
1100 NEW YORK AVENUE, N.W.			FREDRICKSON, COURTNEY B	
WASHINGTON, DC 20005				
ART UNIT		PAPER NUMBER		
3783				
NOTIFICATION DATE		DELIVERY MODE		
03/30/2023		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

e-office@sternekessler.com

**Office Action Summary****Application No.**

17/181,057

**Applicant(s)**

O'TOOLE et al.

**Examiner**

COURTNEY FREDRICKSON

**Art Unit**

3783

**AIA (FITF) Status**

Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 26 January 2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.

2a) ☐ This action is **FINAL**.

2b) ☒ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims\***

5) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are pending in the application.

5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

6) ☐ Claim(s) \_\_\_\_ is/are allowed.

7) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are rejected.

8) ☐ Claim(s) \_\_\_\_ is/are objected to.

9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 22 February 2021 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a) ☒ All      b) ☐ Some\*\*      c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

3) ☐ Interview Summary (PTO-413)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)

Paper No(s)/Mail Date \_\_\_\_.

4) ☐ Other: \_\_\_\_.

Paper No(s)/Mail Date \_\_\_\_.

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Art Unit: 3783

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## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 26, 2023 has been entered.

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Response to Amendment***

This office action is responsive to the amendment filed on January 26, 2023. As directed by the amendment: claims 1, 16, and 34 have been amended. Thus, claims 1, 3-22, 24, 25, and 28-34 are presently pending in this application.

Applicant's amendments to the Specification, Drawings, and Claims have overcome each and every objection previously set forth in the Final Office Action mailed October 26, 2022.

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### ***Response to Arguments***

Applicant's arguments, see pg. 8, filed January 26, 2023, with respect to the rejection(s) of claim(s) 1 under 35 U.S.C 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Applicant's amendments.

### ***Claim Objections***

**Claim 1** is objected to because of the following informalities: the claim should be amended to recite "to define a spacing..." in the second to last line to provide antecedent basis for the claim terminology. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**Claims 1, 3-22, 24, 25, and 28-34** are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

**Regarding claim 1**, the claim was amended to include a guide line which is configured to define the spacing of the nipple from the side of the wall of the nipple tunnel. It is unclear, in light of the specification, how a singular guide line would be able

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to perform this function as it appears that two guide lines would be required to perform the function. With a singular guide line, the shield can be rotated 360° so that the guide line can be located anywhere relative to the nipple and would not be able to perform the function.

**Further regarding claim 1**, it is unclear how the guide line defines the spacing of the nipple from the side wall of the nipple tunnel. It appears that a spacing (even if the spacing is zero) would inherently exist in every combination of nipple and nipple tunnel. A review of Applicant's specification shows that the guide line(s) are configured to define the correct spacing of the nipple from the side wall of the nipple tunnel (paragraph 452 of the published application). For examination purposes, this interpretation was used.

**Regarding claim 32**, the claim is drawn to "fit lines" and is dependent on claim 1 which was amended to include a "guide line". It is unclear if the fit lines are a part of the guide line or if the fit lines are separate from the guide line. For examination purposes, the fit lines are considered the same/a part of the guide line of claim 1.

**Claims 3-22, 24, 25, 28-31, 33, and 34** are also rejected by virtue of being dependent on claim 1.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.



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The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1, 3, 6-8, 10, 11, 14, 16-18, 22, 24, 31, 32, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers (US 20080275386) and in further view of Cook (EP 2502640) and in further view of Silver (US 20020198489).**

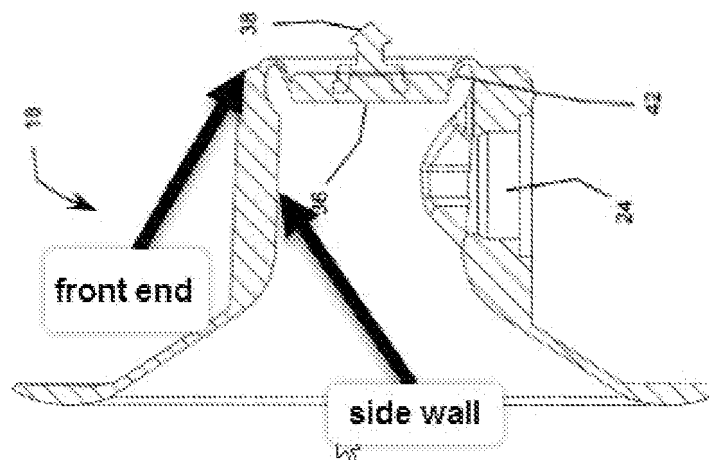
**Regarding claim 1**, Myers discloses a breast pump device comprising:

- (i) a housing (outer housing 16 in fig. 1) comprising (a) a battery (AA battery 51 in fig. 10), and (b) a pump configured to generate negative air pressure (motor 54 in fig. 10);
- (ii) a breast shield (breast cup 16 in fig. 1) being configured to slide in and out of the housing (paragraph 58 discloses that the cup “clicks” into place within the housing; paragraph 42 discloses the breast cup being removable), the breast shield comprising a breast flange (outer flange area 50 in fig. 5) and a nipple tunnel (nipple tunnel 46 in fig.

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5) comprising a side wall and a front end (see below), in which the breast shield is transparent or optically clear (paragraph 65); and



(iii) a milk container that is configured to be attached to and removed from the housing (collection bag 28 is shown to be operatively attached to the housing and is physically engaged to the bottom portion of the housing).

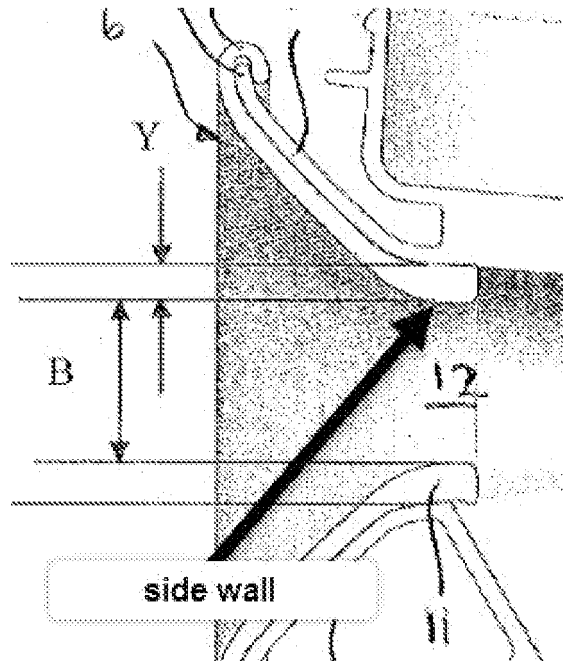
However, Myers does not teach or disclose the breast shield being of a plurality of interchangeable breast shields each of the plurality of interchangeable breast shields having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel comprises a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple

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tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in

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fig. 28). Silver further teaches that the nipple tunnel has a guide line (longitudinal rib 1160 in fig. 28) which is configured to define the correct spacing of the nipple from the side of the nipple tunnel (a user can use the rib as a guide for the correct spacing; if a rib physically touches the user's nipple, for example, the spacing between the nipple and the side wall may not be optimal). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of modified Myers to include a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

**Regarding claim 3**, in the modified device of Myers, Myers discloses the breast shield is rigid (paragraph 47 discloses the nipple tunnel, which is part of the breast shield, is rigid).

**Regarding claim 6**, in the modified device of Myers, Myers discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Myers is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

**Regarding claim 7**, in the modified device of Myers, Myers discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 9A/B shows a singular inner surface which would extend from the nipple to the breast).

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**Regarding claim 8**, in the modified device of Myers, Myers discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 5 shows a singular item).

**Regarding claim 10**, in the modified device of Myers, Myers discloses the breast shield is configured to slide into the housing with a single push action (paragraph 58 discloses the shield can click into place).

**Regarding claim 11**, in the modified device of Myers, Myers discloses the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump (flange top 36 in fig. 9A).

**Regarding claim 14**, in the modified device of Myers, Myers discloses milk container attaches to a lower part of the housing (fig. 1 shows a part of the collection bag attached to the bottom part of the housing 16) and forms a base of the breast pump device (fig. 1).

**Regarding claim 16**, in the modified device of Myers, Silver discloses the guide line configured to run parallel along one or more sides of the nipple tunnel (fig. 28 shows the lines 1160 as longitudinal lines).

**Regarding claim 17**, in the modified device of Myers, Myers discloses the nipple tunnel includes an air hole or passage (24 in fig. 9A), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (paragraph 52).

**Regarding claim 18**, in the modified device of Myers, Myers discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (outlet 24 in fig. 9A).

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**Regarding claim 22**, in the modified device of Myers, Myers discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 1; paragraph 40).

**Regarding claim 24**, in the modified device of Myers, Myers discloses the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg (paragraph 72).

**Regarding claim 31**, modified Myers teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 32**, modified Myers teaches each of the plurality of interchangeable breast shields comprises fit lines in a nipple tunnel of that breast shield (Silver discloses longitudinal ribs 1160, 1164, and 1166 in fig. 28) that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (since Myers discloses that the breast shield is transparent in paragraph 65, a user would be able to assess the spacing between the ribs and the nipple).

**Regarding claim 34**, in the modified device of Myers, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 4 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Phillips (US 20160296682), as evidenced by Yuen (US 20050228342).**

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**Regarding claim 4**, modified Myers teaches all of the claimed limitations set forth in claim 1, as discussed above. Myers further teaches the breast shield is made from plastic (paragraph 40 discloses the breast cup being made from silicone, which is a type of plastic, as evidenced by Yuen in paragraph 24). However, modified Myers does not teach or disclose breast shield is dishwasher safe.

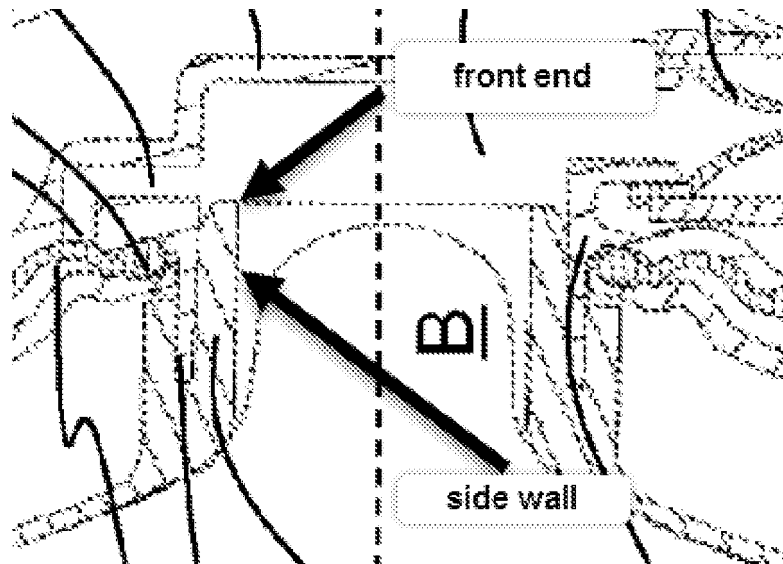
Phillips teaches a breast pump device (fig. 1) comprising a breast shield (110 in fig. 1). Phillips further teaches that the shield can be washed in a dishwasher (paragraph 60). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Myers to be dishwasher safe for the purpose of enabling the shield to be cleaned in the dishwasher for reuse, as taught by Phillips (paragraph 60).

**Claims 1, 6-10, 14, 17-18, 20-22, 31, 32, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil (US 20130023821) in view of Myers (US 20080275386) and in further view of Cook and in further view of Silver.**

**Regarding claim 1**, Khalil discloses a breast pump device comprising:

(i) a housing (6' and 6" form a housing as shown in fig. 9) that includes (a) a power source (paragraph 32 discloses the power source integrated into the housing), and (b) a pump generating negative air pressure (vacuum pump 81 in fig. 10);

(ii) a breast shield (breast interface 1 in fig. 11) being configured to slide in and out of the housing (breast interface 1 is configured to slide in/out from the housing by attaching/detaching the lip 11 to the flange 62 of the housing as shown in fig. 4), the breast shield made up of a breast flange (base part 12 in fig. 4) and a nipple tunnel (stub 10 in fig. 4) comprising a side wall and a front end (see below); and



(iii) a milk container that is configured to be attached to and removed from the housing (milk collection container 7' in fig. 11; paragraph 69 discloses the container being releasably connected to the housing part 6').

However, Khalil does not teach or disclose the power source being a battery and the breast shield being transparent or optically clear and being of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel having a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.

Myers teaches a similar breast pump system (fig. 1) having a housing (outer housing 16 in fig. 1) which comprises a battery (battery 52 in fig. 10) and a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent). Therefore, it would have been obvious to one of ordinary skill

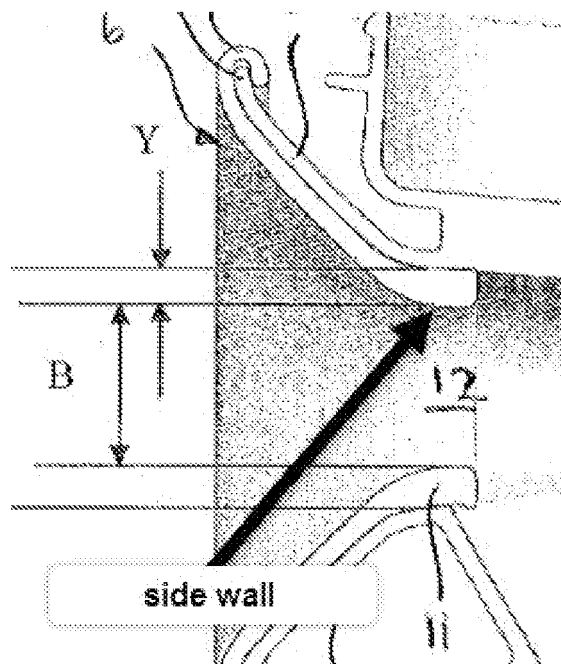


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before the effective filing date of the claimed invention to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device and to have made the breast shield transparent to enable a user to view the condition of a nipple (paragraph 65).

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality

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of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has a guide line (longitudinal rib 1160 in fig. 28) which is configured to define the correct spacing of the nipple from the side of the nipple tunnel (a user can use the rib as a guide for the correct spacing; if a rib physically touches the user's nipple, for example, the spacing between the nipple and the side wall may not be optimal). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of modified Khalil to include a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

**Regarding claim 6**, in the modified device of Khalil, Khalil discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Khalil is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

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**Regarding claim 7**, in the modified device of Khalil, Khalil discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 11).

**Regarding claim 8**, in the modified device of Khalil, Khalil discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 11).

**Regarding claim 9**, in the modified device of Khalil, Khalil discloses the breast shield is generally symmetrical about a centre-line running from a top to a bottom of the breast shield when positioned upright for normal use (fig. 11).

**Regarding claim 10**, in the modified device of Khalil, Khalil discloses the breast shield is configured to slide into the housing with a single push action (the shield of Khalil is functionally capable of being pushed into the housing so that the nipple tunnel is located in the housing).

**Regarding claim 14**, in the modified device of Khalil, Khalil discloses milk container attaches to a lower part of the housing and forms a base of the breast pump device (fig. 9).

**Regarding claim 16**, in the modified device of Khalil, Silver discloses the guide line is configured to run parallel along one or more sides of the nipple tunnel (fig. 28).

**Regarding claim 17**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes an air hole or passage (opening 13 in fig. 3), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (figs. 4 and 5).

**Regarding claim 18**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (opening 13 in fig. 3 is considered to be on a “lower” surface of the nipple tunnel since “lower” is not further defined; see fig. 5).

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**Regarding claim 22**, in the modified device of Khalil, Khalil discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 9).

**Regarding claim 31**, modified Khalil teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 32**, modified Khalil teaches each of the plurality of interchangeable breast shields comprises fit lines in a nipple tunnel of that breast shield (Silver discloses longitudinal ribs 1160, 1164, and 1166 in fig. 28) that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (since Myers discloses that the breast shield is transparent in paragraph 65, a user would be able to assess the spacing between the ribs and the nipple).

**Regarding claim 34**, in the modified device of Khalil, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 5 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Chang (US 20180333523).**

**Regarding claim 5**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast shield is configured to attach using magnets to the housing.

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Chang teaches a substantially similar self-contained breast pump system (breast pump system 10 in fig. 1A) having a breast shield (flange 14 in fig. 1A) attached to a housing (housing 12 in fig. 1A) and configured to attach to the housing using one or more magnets (paragraph 108 discloses the shield uses magnets 118 attached to the shield to determine if the shield is properly attached to the housing). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Khalil to be configured to attach using magnets to the housing since Chang teaches this configuration provides a safeguard such that the system will not operate unless all components are fully connected (paragraph 108).

**Claims 12 and 13 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Phillips (US 20160296682).**

**Regarding claim 12**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Although it appears based on fig. 11 of Khalil that the container would be rigid, modified Khalil does not explicitly teach or disclose this limitation.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is substantially rigid (paragraph 57 discloses the container being made from Tritan; pg. 21 of Applicant's specification discloses that Tritan is a polycarbonate material, which is a known rigid material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be

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made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Regarding claim 13**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further discloses the milk container is an optically clear, plastic container (paragraph 69 discloses the container is made of plastic like cover 6" and is transparent in its entirety). However, Khalil does not explicitly teach or disclose the milk container is dishwasher safe.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is dishwasher safe (paragraph 57 discloses the container being made from Tritan; pg. 21, lines 13-18 of Applicant's specification discloses that Tritan a dishwasher safe material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Claim 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Karsan (US 20070228059).**

**Regarding claim 15**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the milk container is configured to magnetically attach to the housing.

Khalil teaches that the milk container latches to the housing by a locking lug (paragraph 69 discloses a locking lug formed on the container latches engages into a

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corresponding recess). Karsan teaches a container (1 in fig. 1) having a case (2 in fig. 3) and a base (fig. 3) which are releasably held together (paragraph 51 discloses the connection being releasable) via a latch mechanism (5 and 6 in fig. 3). Karsan further teaches that the latching mechanism is embodied as a lug and recess (5 and 6, respectively in fig. 3; paragraph 65) but may alternatively be embodied as a magnetic means so that the two components may be magnetically latched (paragraph 65).

In Applicant's invention, Applicant uses the magnets to removably secure the milk container to the housing. Thus, Karsan is reasonably pertinent to the problem faced by the inventor since Karsan teaches using magnets as a removable latching connection between two components. As Karsan teaches that the magnetic means (paragraph 65) are functional equivalents to a locking lug and recess (paragraph 65), it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have substituted the locking lug/recess configuration of Khalil with the magnetic means, as taught by Karsan. The substitution would have resulted in providing an equivalent secure attachment of the milk container to the housing.

**Claim 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Blondheim (US 20120277636).**

**Regarding claim 19**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump comprises one or more piezo air pumps.

Blondheim is directed towards a breast pump device (fig. 1) which comprises an air pump (66 in fig. 6). Blondheim further teaches that the air pump can be a

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piezoelectric pump (paragraph 36). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the pump of modified Khalil to be a piezoelectric pump, as taught by Blondheim for the purpose of rendering the pump small in size (paragraph 36).

**Claims 20 and 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Barak (US 20140378895).**

**Regarding claim 20**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing further includes a Universal Serial Bus (USB) charging socket.

Barack is directed towards a breast pump device (fig. 1) which comprises a housing which houses a pump (fig. 1 shows a pump 20 which would necessarily have some sort of housing since it is disclosed to have a USB port and a user interface). Barack further teaches a USB charging socket (USB port 34 in fig. 1; paragraph 45). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include the USB charging socket, as taught by Khalil, for the purpose of enabling the device to interface with an external memory (paragraph 45).

**Regarding claim 21**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing includes a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track



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pumping sessions, to indicate whether that particular session is associated with a left or a right breast.

Barack teaches a breast pump device (fig. 1) which has a control electronics (controller 22 in fig. 1) and a control interface (user interface 30 in fig. 1) that is user selectable to indicate or record if milk is being expressed from the left or right breast (paragraph 43) and that, when selected for a particular pumping session, sends data to a connected application, running on a device, such as a smartphone, that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast (paragraph 46 discloses transmitting via transceiver the parameters that have been entered at the user interface 30 to a remote device; paragraph 43 discloses that one parameter entered at the user interface is which breast is selected).

Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast, as taught by Barack. This modification would enable a user to track which parameters are best suited for each breast to optimize pumping, as taught by Barack (paragraphs 8 and 43).

**Claim 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Guthrie (US 20160220743).**

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**Regarding claim 25**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device includes a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.

Guthrie is directed towards a breast pump device comprising a sensor (detector 607 in fig. 6B) that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container (paragraph 63 discloses that the emitter 606 and the detector 607 operate to detect light reflecting off the opaque surface of the milk). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device to include a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container, as taught by Guthrie, for the purpose of measuring volume of milk pumped (paragraph 54).

**Claim 29 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Mendoza (US 6227936).**

**Regarding claim 29**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump is a

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lightweight air pump that enables the total mass of the breast pump system, unfilled with milk, to be less than 250gm.

Mendoza teaches a bra which is designed to support a breast pump to allow the mother's hands to remain free (1:8-12). Mendoza further discloses that the bra must be able to support up to 8 ounces when the pump is full (1:58-62). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the system of modified Khalil to be a lightweight air pump that enables the total weight of the system, unfilled with milk, to be less than 250gm, as taught by Mendoza since Mendoza teaches that a lightweight system is crucial for enabling the system to be supported by a bra.

**Claim 30 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, in further view of Baker (US 20090281485).**

**Regarding claim 30**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

Baker is directed towards a device for removing fluid from a body (fig. 6) using a vacuum pump embodied as a motor (motor 9 in fig. 6; paragraph 243). Baker further teaches that the device makes less than 20 decibel of noise at full power (paragraph 121) by sound proofing the walls of the housing and by adding a counter balance to the motor (paragraph 144). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device of

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modified Khalil to have the device make less than 20 dB of noise during maximum power for the purpose of making the device for discrete and comfortable for the user and others around the user.

**Claim 33 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, in further view of Meyers (US 5542921).**

**Regarding claim 33**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further teaches control electronics (“control elements and a display” in paragraph 51) which would be powered by the battery (the power source of Khalil is understood to power the device).

However, Khalil does not teach or disclose the battery to be rechargeable and the housing further including a power charging circuit for controlling the charging of the rechargeable battery.

Meyers is directed to a breast pump device (fig. 1) comprising a battery configured to be recharged (9:50-52 discloses recharging the batteries) and a power charging circuit for controlling the charging of the rechargeable battery (“circuit” in 9:50-52). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the battery of modified Khalil to be rechargeable and to have incorporated a power charging circuit for controlling the charging of the rechargeable battery, as taught by Meyers to enable the batteries to be reused.

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

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The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit [www.uspto.gov/patent/patents-forms](http://www.uspto.gov/patent/patents-forms). The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to [www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp](http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp).

**Claims 1, 3-22, 24, 25, 29-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the issued patents below in view of Myers, Cook, Silver, and the teachings below (see table).**

- **17203050 (US Patent 11357893)**
- **17203079 (US Patent 11376352)**
- **17203216 (US Patent 11357894)**
- **17203259 (US Patent 11324866)**
- **17203327 (US Patent 11413380)**

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of

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interchangeable breast shields is placed onto a breast; and the nipple tunnel having a guide line, the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to

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provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has a guide line (longitudinal rib 1160 in fig. 28) which is configured to define the correct spacing of the nipple from the side of the nipple tunnel (a user can use the rib as a guide for the correct spacing; if a rib physically touches the user's nipple, for example, the spacing between the nipple and the side wall may not be optimal). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.



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7	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25	Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 28-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following US Patents in view of Myers, Cook and the teachings below (see table).**

- **17203109 (US Patent 11260151)**
- **17203313 (US Patent 11311654)**

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel having a guide line, the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.

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Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches

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that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has a guide line (longitudinal rib 1160 in fig. 28) which is configured to define the correct spacing of the nipple from the side of the nipple tunnel (a user can use the rib as a guide for the correct spacing; if a rib physically touches the user's nipple, for example, the spacing between the nipple and the side wall may not be optimal). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
28	18 ('151 patent), 13 ('654 patent)	
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 29-34 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following copending applications in view Myers, Cook and the teachings below.**

- 17203150
- 17203179
- 17203292
- 17203355
- 17203384
- 17203397

- **17203418**

Claim 1 of the reference claim claims all of the features claimed in reference claim 1 except in that claim 1 of the reference claim does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel having a guide line, the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of

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interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has a guide line (longitudinal rib 1160 in fig. 28) which is configured to define the correct spacing of the nipple from the side of the nipple tunnel (a user can use the rib as a guide for the correct spacing; if a rib physically touches the user's nipple, for example, the spacing between the nipple and the side wall may not be optimal). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include a guide line, wherein the guide line is configured to define the spacing of the nipple from the side wall of the nipple tunnel, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).



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App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9		Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15		Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16		Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19		Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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20		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

### ***Allowable Subject Matter***

Except for the double patenting rejections above, **claim 28** would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not teach or suggest the pump delivers the claimed stall pressure and free air flow.

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### ***Conclusion***

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to COURTNEY FREDRICKSON whose telephone number is (571)270-7481. The examiner can normally be reached Monday-Friday (9 AM - 5 PM EST).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NATHAN PRICE can be reached on 571-270-5421. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center,

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visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and

<https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service

Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/COURTNEY B FREDRICKSON/  
Examiner, Art Unit 3783

<b><i>Notice of References Cited</i></b>	Application/Control No. 17/181,057		Applicant(s)/Patent Under Reexamination O'TOOLE et al.	
	Examiner COURTNEY FREDRICKSON		Art Unit 3783	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20020198489-A1	12-2002	Silver, Brian H.	A61M1/066	119/14.47
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					


**FOREIGN PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC - Searched*		
Symbol	Date	Examiner
a61m1/06-069	01/12/2022	cbf

CPC Combination Sets - Searched*		
Symbol	Date	Examiner


US Classification - Searched*			
Class	Subclass	Date	Examiner

\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see SEARCH history	01/12/2022	cbf
searched inventors in PALM and SEARCH	01/12/2022	cbf
consulted child search history	01/12/2022	cbf
Updated search history	10/17/2022	cbf
Updated search	03/24/2023	cbf

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/COURTNEY B FREDRICKSON/ Examiner, Art Unit 3783	
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<b><i>Index of Claims</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

CLAIMS										
<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	01/12/2022	10/17/2022	03/24/2023						
	1	✓	✓	✓						
	2	✓	-	-						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
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	24	✓	✓	✓						
	25	✓	✓	✓						
	26	-	-	-						
	27	-	-	-						
	28	✓	✓	✓						
	29	✓	✓	✓						
	30	✓	✓	✓						
	31	✓	✓	✓						
	32	✓	✓	✓						
	33	✓	✓	✓						
	34		✓	✓						

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	494	4	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	US1	2012/0109083 A1	05-03-2012	Coulthard et al.	
	US2	2016/0135998 A1	05-19-2016	Riesinger	
	US3	2014/0142501 A1	05-22-2014	Clark et al.	
	US4	2018/0104396 A1	04-19-2018	Park	
	US5	10,864,306 B2	12-15-2020	Fujisaki	
	US6	5,406,063 A	04-11-1995	Jelen	
	US7	2005/0245860 A1	11-03-2005	Britto et al.	
	US8	2007/0236584 A1	10-11-2007	Frost-Ruebling et al.	
	US9	2018/0008758 A1	01-11-2018	Garbez et al.	
	US10	2008/0299517 A1	12-04-2008	Delaney, II	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP1	JP 2013-545519 A	12-26-2013	KCI Licensing, Inc.		X
	FP2	JP 2016-524490 A	08-18-2016	BSN Medical GmbH		X
	FP3	WO 2013/064852 A1	05-10-2013	Smith & Nephew PLC		
	FP4	JP 2014-532498 A	12-08-2014	Smith & Nephew PLC		X
	FP5	WO 2016/006458 A1	01-14-2016	Murata Manufacturing Co., Ltd.		X
	FP6	JP H 11-178917 A	07-06-1999	Hirose Electric Co., Ltd.		X
	FP7	JP 2000-350527 A	12-19-2000	Pigeon Corp.		X
	FP8	WO 2016/007561 A1	01-14-2016	Naya Health Inc.		
	FP9	WO 2016/025405 A1	02-18-2016	Barral et al.		
	FP10	WO 2004/108184 A2	12-16-2004	Playtex Products, Inc.		
	FP11	JP 2016-526396 A	09-05-2016	Koninklijke Philips NV		X

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
				Attorney Docket Number	4944.0120006
Sheet	2	494	4		

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP12	WO 2014/160614 A1	10-02-2014	Naia Health, Inc.		
	FP13	JP 2017-503552 A	02-02-2017	Nestec SA		X

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

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Sheet	3	494	4		

NON-PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.		T <sup>2</sup>
	NPL1	International Search Report issued in International Application No. PCT/GB2021/050764, mailed July 6, 2021, 5 pages.		<input type="checkbox"/>
	NPL2	Japanese Search Report issued in Japanese Application No. 2020-519188, mailed June 24, 2022, 20 pages.		<input type="checkbox"/>
	NPL3	Extended European Search Report issued in European Application No. 22174446.9, mailed October 11, 2022; 26 pages.		<input type="checkbox"/>

/COURTNEY B FREDRICKSON/

03/24/2023

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO

**SUPPLEMENTAL INFORMATION  
DISCLOSURE STATEMENT BY  
APPLICANT****Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	COURTNEY B FREDRICKSON
Attorney Docket Number	4944.0120006

Sheet	4	494	4
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Richard D. Collier III/	Date (YYYY-MM-DD)	2023-01-26
Name/Print	Richard D. Collier III	Registration Number	60,390

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	17/181057.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:05 PM
L2	128	((("O'TOOLE") near3 ("Jonathan")) OR ("ROLLO") near3 ("Adam")) OR ("CARR") near3 ("Andrew"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/12/31 01:05 PM
L3	8470	a61m1/06-069.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L5	2	("20170216505").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L6	8	("20130023821" "20070219486" "20160296682").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:14 PM
L7	2	("20140378895").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:16 PM
L8	2	("7824363").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU,	OR	ON	ON	2022/01/01 01:04 PM

L9	126	("10881766" OR "10926011" OR "20040087898" OR "20090281482" OR "20100292636" OR "20120165729" OR "20140263611" OR "20160228625" OR "20180110900" OR "20210196873" OR "20210196874" OR "20210196875" OR "20210196876" OR "20210205511" OR "20210205512" OR "20210205513" OR "20210205514" OR "20210205515" OR "20210205516" OR "20210205517" OR "20210205518" OR "20210228789" OR "20210268158" OR "7666162" OR "8608685" OR "20070135761" OR "20070179439" OR "20090281485" OR "20110009824" OR "20160271305" OR "20160296682" OR "20160325031" OR "20170095599" OR "20170112983" OR "20180028733" OR "20180333523" OR "5542921" OR "7833190" OR "10039871" OR "20020193731" OR "20040056641" OR "20040074281" OR "20040267215" OR "20050219302" OR "20060122575" OR "20070051172" OR "20070051727" OR "20080177224" OR "20080262420" OR "20080275386" OR "20110004154" OR "20110196291" OR "20110274566" OR "20120277636" OR "20130023821" OR	SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2022/01/12 05:14 PM
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		"20140031744" OR "20140052056" OR "20140275857" OR "20140323962" OR "20140378895" OR "20150217036" OR "20150217037" OR "20150283311" OR "20160000980" OR "20160058928" OR "20160058929" OR "20160082165" OR "20160082166" OR "20160151551" OR "20160158424" OR "20160166745" OR "20160206794" OR "20160220743" OR "20160220745" OR "20160256617" OR "20160287767" OR "20160296681" OR "20160310650" OR "20170021068" OR "20170035951" OR "20170043065" OR "20170072117" OR "20170072118" OR "20170143879" OR "20170220753" OR "20180021490" OR "20180110906" OR "2849881" OR "4390024" OR "4535627" OR "5474683" OR "5941847" OR "5973770" OR "6045529" OR "6090065" OR "6227936" OR "6328709" OR "6358226" OR "6383163" OR "6440100" OR "6461324" OR "6547756" OR "6579258" OR "6663587" OR "6749582" OR "7048519" OR "7201735" OR "7312554" OR "7314400" OR "7662018" OR "7776008" OR "8057425" OR "8118772" OR					
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L10	45	"8187227" OR "8262606" OR "8282596" OR "8376986" OR "8702646" OR "8801495" OR "8876760" OR "8926556" OR "9033913" OR "9173587" OR "9345274" OR "9539377" OR "D548831").pn. 9 AND (transparent)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/12 06:05 PM
L11	105	3 AND (batter\$4) AND ((interface flange shield cup) WITH (clear transparent))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/13 02:07 PM
L12	382	3 AND (silicone WITH plastic)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 10:40 AM
L13	2	("20180333523").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 11:50 AM
L14	43	3 AND ((USB "universal service bus") WITH (charg\$4 recharg\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:19 PM
L15	2	("20160220743").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD,	OR	ON	ON	2022/01/14 12:42 PM

L16	5	("5542921").pn.	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:52 PM
L20	256	3 AND ((shield cup interface flange) WITH (siz\$4) WITH different)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:23 PM
L21	2	("20120165729").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:31 PM
L22	2	("10881766").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:23 PM
L23	2	("10926011").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:38 PM
L24	12	("20080275386" "20140378895" "20130023821" "20180333523" "20160296682" "20070228059" "20120277636" "20160220743" "6227936" "20090281485" "20120165729"	(US-PGPUB; USPAT)	OR	ON	ON	2022/01/14 03:55 PM



L25	267	"5542921").pn. 3 AND (nipple WITH (chang\$4 differ\$4 adjust\$4 dissimilar\$4) WITH (size width))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/17 03:06 PM
L26	2	"44148977".fmid.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; JPO)	OR	ON	ON	2022/10/17 03:31 PM
L27	1	("10926011").pn.	(USPAT)	OR	ON	ON	2022/10/19 04:47 PM
L28	11	("0000002" OR "10864306" OR "20050245860" OR "20070236584" OR "20080299517" OR "20120109083" OR "20140142501" OR "20160135998" OR "20180008758" OR "20180104396" OR "5406063").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/24 04:55 PM
L29	91	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (indicator line guid\$4 symbol indicia))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:26 PM
L30	17	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (mark\$4 label))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:31 PM
L31	2	("20020198489").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/03/24 05:34 PM

L32	19	(breast WITH shield) AND (size WITH label\$4)	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:55 PM
L33	1	(09/888322).APP.	(USPAT; USOCR)	OR	ON	ON	2023/03/24 05:56 PM

**PE2E SEARCH - Search History (Interference)**

There are no Interference searches to show.

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				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>

Examiner Signature		Date Considered	
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				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	3	of	3		

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- ☐ See attached certification statement.
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- ☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Richard D. Collier III/	Date (YYYY-MM-DD)	2023-04-20
Name/Print	Richard D. Collier III	Registration Number	60,390

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UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**04/20/2023 04:08:22 PM ET**ATTORNEY DOCKET #  
**4944.0120006****Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 61955806

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Richard Collier

**Documents****TOTAL DOCUMENTS: 3**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2023-04-20-Transmittal-Form-sIDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	160 KB
2023-04-20-sIDS-Pleading-4944-0120006.pdf	2	Transmittal Letter	112 KB
2023-04-20-sIDS-Form-SB08-4944-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	146 KB

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## DOCUMENT

## MESSAGE DIGEST(SHA-512)

2023-04-20-Transmittal-Form-  
sIDS-4944-0120006.pdf

D4933E5E447819C7BB67851D70E380B09815BAC1C0301E0281  
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2023-04-20-sIDS-Pleading-  
4944-0120006.pdf

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2023-04-20-sIDS-Form-SB08-  
4944-0120006.pdf

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**National Stage of an International Application under 35 U.S.C. 371**

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## TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

### ENCLOSURES (Check all that apply)

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Fee Transmittal Form<br><input checked="" type="checkbox"/> Fee Attached<br><input type="checkbox"/> Amendment/Reply<br><input type="checkbox"/> After Final<br><input type="checkbox"/> Affidavits/declaration(s)<br><input type="checkbox"/> Extension of Time Request<br><input type="checkbox"/> Express Abandonment Request<br><input checked="" type="checkbox"/> Information Disclosure Statement<br><input type="checkbox"/> Certified Copy of Priority Document(s)<br><input type="checkbox"/> Reply to Missing Parts/<br>Incomplete Application<br><input type="checkbox"/> Reply to Missing Parts<br>under 37 CFR 1.52 or 1.53 | <input type="checkbox"/> Drawing(s)<br><input type="checkbox"/> Licensing-related Papers<br><input type="checkbox"/> Petition<br><input type="checkbox"/> Petition to Convert to a<br>Provisional Application<br><input type="checkbox"/> Power of Attorney, Revocation<br>Change of Correspondence Address<br><input type="checkbox"/> Terminal Disclaimer<br><input type="checkbox"/> Request for Refund<br><input type="checkbox"/> CD, Number of CD(s) _____<br><input type="checkbox"/> Landscape Table on CD | <input type="checkbox"/> After Allowance Communication to TC<br><input type="checkbox"/> Appeal Communication to Board<br>of Appeals and Interferences<br><input type="checkbox"/> Appeal Communication to TC<br>(Appeal Notice, Brief, Reply Brief)<br><input type="checkbox"/> Proprietary Information<br><input type="checkbox"/> Status Letter<br><input type="checkbox"/> Other Enclosure(s) (please identify<br>below): |
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### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Richard D. Collier III/		
Printed name	Richard D. Collier III		
Date	April 20, 2023	Reg. No.	60,390

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(c) and is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office

- 2 -

Jonathan O'TOOLE  
Application No.: 17/181,057

Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application. The required fee is provided through online credit card payment authorization in the amount of **\$104.00** in payment of the fee under 37 C.F.R. § 1.17(p).

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Richard D. Collier III  
Attorney for Applicant  
Registration No. 60,390

Date: April 20, 2023

1100 New York Avenue, N.W.  
Washington, D.C. 20005-3934  
(202) 371-2600

20127596.1

Atty. Dkt. No. 4944.0120006

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov**ELECTRONIC PAYMENT RECEIPT**APPLICATION #  
17/181,057RECEIPT DATE / TIME  
04/20/2023 04:08:22 PM ETATTORNEY DOCKET #  
4944.0120006**Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitton

PATENT CENTER # 61955806

AUTHORIZED BY Richard Collier

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE  
ADDRESS -FIRST NAMED  
INVENTOR Jonathan O'TOOLE**Payment Information**PAYMENT METHOD  
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Sheet	1	of	3
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Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>

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# SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet	3	of	3
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2023-05-15
Name/Print	Yangbeini Wang	Registration Number	800,005

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UNITED STATES  
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www.uspto.gov**ELECTRONIC PAYMENT RECEIPT**APPLICATION #  
17/181,057RECEIPT DATE / TIME  
05/15/2023 03:27:41 PM ETATTORNEY DOCKET #  
4944.0120006**Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitton

PATENT CENTER # 62088330

AUTHORIZED BY Yangbeini Wang

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE  
ADDRESS -FIRST NAMED  
INVENTOR Jonathan O'TOOLE**Payment Information**PAYMENT METHOD  
CARD / 1008PAYMENT TRANSACTION ID  
E20235EF29268657PAYMENT AUTHORIZED BY  
Jon Baitton

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
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<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	February 22, 2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDERICKSON, Courtney B
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s)  <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Copy of FP1.
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	May 15, 2023	Reg. No.	800,005

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(11)

**EP 3 482 782 A1**

(12)

# EUROPÄISCHE PATENTANMELDUNG

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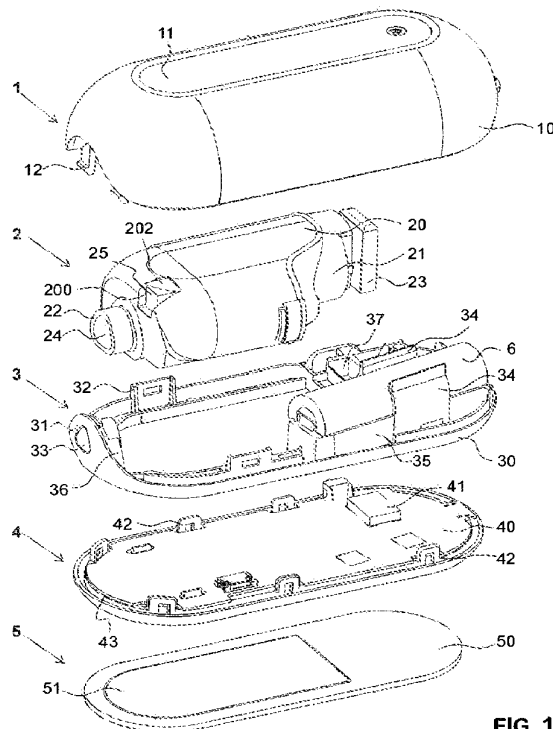
**Giesshübelstrasse 45**

Postfach 1772

8027 Zürich (CH)

(54) MEDIZINISCHE SAUGPUMPE

(57) Eine motorbetriebene medizinische Saugpumpe weist ein Pumpaggregat zur Erzeugung eines Unterdrucks, einen Pumpaggregatsträger (3) zur Halterung des Pumpaggregats (7) und eine Aufnahme (35) zur Aufnahme eines Energiespeichers (7) auf. Das im Pumpaggregatsträger (3) angeordnete Pumpaggregat (7) definiert eine erste Längsachse ( $L_1$ ) und die Aufnahme (35) definiert eine zweite Längsachse ( $L_2$ ). Der Pumpaggregatsträger (3) bildet die Aufnahme (35). Die zweite Längsachse ( $L_2$ ) verläuft in einem Winkel zur ersten Längsachse ( $L_1$ ). Diese Saugpumpe ist klein und kompakt und weist eine gute Schalldämpfung auf.



**FIG. 1**

**EP 3 482 782 A1**

## EP 3 482 782 A1

## Beschreibung

## TECHNISCHES GEBIET

5 **[0001]** Die vorliegende Erfindung betrifft eine medizinische Saugpumpe, insbesondere eine motorbetriebene medizinische Saugpumpe. Derartige Saugpumpen sind insbesondere Brustpumpen zum Abpumpen von menschlicher Muttermilch oder Drainagepumpen zum Absaugen von Körperflüssigkeiten, wie beispielsweise für die Thoraxdrainage oder für die Wunddrainage.

## 10 STAND DER TECHNIK

**[0002]** Medizinische Saugpumpen, auch Vakuumpumpen genannt, sind für die verschiedensten Anwendungen bekannt. Beispielsweise werden sie als Brustpumpen zum Abpumpen von menschlicher Muttermilch oder als Drainagepumpen zum Absaugen von Körperflüssigkeiten verwendet. Derartige Saugpumpen weisen als Pumpaggregat Kolbenpumpen oder Membranpumpen auf. Die Verwendung einer Pumpmembran hat den Vorteil, dass die Saugpumpe als Ganzes relativ klein und leicht und im Gebrauch tragbar ausgebildet werden kann. Ein sehr kleines und trotzdem die hohen Anforderungen an eine Brustpumpe erfüllendes motorbetriebenes Pumpaggregat ist aus WO 2006/032156 A1 bekannt. Tragbare Saugpumpen weisen üblicherweise auch einen Energiespeicher zum Betreiben eines Motors des Pumpaggregats auf. Die Grösse des Energiespeichers und des Pumpaggregats bestimmen somit im Wesentlichen die Grösse des Pumpengehäuses.

**[0003]** Eine weitere Anforderung an derartige Saugpumpen ist die Schalldämpfung. Das Pumpaggregat ist oft relativ laut und rhythmisch wiederkehrende Geräusche stören den Benützer. Es ist deshalb bekannt, das Pumpaggregat in eine schalldämmende bzw. schalldämpfende Umgebung einzubetten. In diesem Text wird Schalldämmung und Schalldämpfung gleichwertig behandelt und jeweils als Schalldämpfung bezeichnet.

25 **[0004]** WO 2017/157691 A1 offenbart eine medizinische Saugpumpe mit einer elastischen Lagerung des Pumpaggregats innerhalb eines Pumpengehäuses.

**[0005]** In WO 2015/109934 A1 ist das Pumpaggregat in einem geschlossenen inneren Gehäuse angeordnet und eine Batterie ist parallel zum inneren Gehäuse in einem äusseren Pumpengehäuse angeordnet.

30 **[0006]** In WO 2017/140562 A1 ist das Pumpaggregat mittels Federn in einem äusseren Pumpengehäuse befestigt.

## DARSTELLUNG DER ERFINDUNG

**[0007]** Es ist deshalb eine Aufgabe der Erfindung, eine medizinische Saugpumpe zu schaffen, welche möglichst kompakt, jedoch robust ausgebildet ist.

35 **[0008]** Diese Aufgabe löst eine motorbetriebene medizinische Saugpumpe mit den Merkmalen des Patentanspruchs 1.

**[0009]** Die erfindungsgemässe motorbetriebene medizinische Saugpumpe weist ein Pumpaggregat zur Erzeugung eines Unterdrucks, einen Pumpaggregatträger zur Halterung des Pumpaggregats und eine Aufnahme zur Aufnahme eines Energiespeichers auf, wobei das im Pumpaggregatträger angeordnete Pumpaggregat eine erste Längsachse definiert und die Aufnahme eine zweite Längsachse definiert. Erfindungsgemäss bildet der Pumpaggregatträger die Aufnahme und die zweite Längsachse verläuft in einem Winkel zur ersten Längsachse.

40 **[0010]** Da der Pumpaggregatträger die Aufnahme für den Energiespeicher bildet und dank der winkligen Anordnung von Pumpaggregat und Energiespeicher sind praktisch keine Leerräume vorhanden und die Grösse der Saugpumpe insgesamt ist minimiert. Da Pumpaggregat und Energiespeicher von demselben Pumpaggregatträger gehalten sind, ist die Vorrichtung insgesamt relativ steif ausgebildet. Dies erhöht nicht nur die Robustheit der Vorrichtung sondern dies minimiert auch Schwingungen beim Betrieb des Pumpaggregats und reduziert somit die Geräuschbildung bzw. -weiterleitung.

45 **[0011]** In bevorzugten Ausführungsformen ist der Pumpaggregatträger im Wesentlichen als Rahmen ausgebildet. Der Rahmen kann eine beliebige Form aufweisen. Vorzugsweise weist er jedoch eine im Wesentlichen längliche abgerundete Grundform, insbesondere eine elliptische oder ovale Grundform, auf. Die Ausbildung als Rahmen ermöglicht eine Leichtbauweise und erhöht zudem die Steifigkeit. Zudem ist ein Minimum an Material notwendig, was die Herstellungskosten entsprechend minimiert. Der Rahmen ist vorzugsweise einstückig ausgebildet. Vorzugsweise ist er im Spritzgussverfahren aus Kunststoff hergestellt.

50 **[0012]** Vorzugsweise umfasst die Saugpumpe ein erstes Pumpengehäuseteil und ein zweites Pumpengehäuseteil, wobei der Pumpaggregatträger zwischen dem ersten und dem zweiten Pumpengehäuseteil gehalten ist. Dadurch wird er in seiner Lage fixiert und seine Steifigkeit wird erhöht.

55 **[0013]** In bevorzugten Ausführungsformen bildet der Pumpaggregatträger einen Teil des Pumpengehäuses. Er bildet vorzugsweise ein von aussen sichtbares Verbindungsteil zwischen dem ersten und dem zweiten Pumpengehäuseteil. Dies erleichtert den Zusammenbau der einzelnen Bauteile und eine weitere Lagerung des Pumpaggregatträgers inner-

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halb des Pumpengehäuses lässt sich dadurch vermeiden.

**[0014]** Vorzugsweise ist der gesamte Pumpaggregatträger einstückig ausgebildet.

**[0015]** In bevorzugten Ausführungsformen sind mindestens zwei elastische Lager zur Lagerung des Pumpaggregats im Pumpaggregatträger vorhanden. Dadurch lässt sich die Übertragung von Vibrationen und Körperschall vom Pumpaggregat auf den Pumpaggregatträger und somit auf das Pumpengehäuse minimieren bzw. vermeiden. Zudem ist das Pumpaggregat dadurch definiert gehalten und trotzdem flexibel aufgehängt, so dass die Geräuscentwicklung reduziert und/oder gedämpft wird. Vorzugsweise ist eine Zweipunktlagerung vorhanden. Es ist jedoch auch möglich, eine Drei- oder Mehrpunkt Lagerung einzusetzen. Die Lager sind vorzugsweise aus einem Elastomer gebildet.

**[0016]** Vorzugsweise bildet mindestens ein erstes dieser Lager einen Vakuumanschluss. Mindestens ein zweites dieser Lager, welches vorzugsweise das Gegenlager zum ersten Lager bildet, ist vorzugsweise an einem motorseitigen Ende des Pumpaggregats und in Verlängerung einer Motorachse des Pumpaggregats, d.h. in der Flucht der Motorachse, angeordnet.

**[0017]** Vorzugsweise sind genau zwei Lager vorhanden, welche entlang der ersten Längsachse an gegenüberliegenden Enden des Pumpaggregats angeordnet sind. Vorzugsweise sind diese zwei Lager bezüglich der ersten Längsachse versetzt zueinander angeordnet. Die Verwendung von genau zwei elastischen Lagern und/oder die genannte Anordnung der Lager minimiert die Grösse der Saugpumpe insgesamt und führt zudem dazu, dass sich Vibrationen und Körperschall nicht oder nur begrenzt ausbreiten können.

**[0018]** Die Schalldämpfung ist optimiert, wenn das Pumpaggregat in einem Schalldämpfungsgehäuse angeordnet ist und das Schalldämpfungsgehäuse im Pumpaggregatträger gehalten ist.

**[0019]** Vorzugsweise ist eine Lufteinlassöffnung vorhanden, welche von einem Schalldämpfungselement überdeckt ist. Vorzugsweise ist die Lufteinlassöffnung im Schalldämpfungsgehäuse angeordnet, welches Zischgeräusche beim Einsaugen der Umgebungsluft minimiert. Das Schalldämpfungselement besteht vorzugsweise aus Schaumstoff oder aus einem anderen geeigneten porösen oder luftdurchlässigen Material. Das Pumpengehäuse ist vorzugsweise auf bekannte Art und Weise undicht ausgebildet, so dass über mehrere Stellen ein Luftaustausch vom Innenraum des Pumpengehäuses in die Umgebung und umgekehrt stattfinden kann.

**[0020]** Vorzugsweise weist das Schalldämpfungsgehäuse ein Etui mit einer Aufnahmeöffnung zur Aufnahme des Pumpaggregats und einen das Etui verschliessenden Deckel auf, wobei der Deckel gebogen ausgebildet ist. Dies erleichtert den Zusammenbau der Vorrichtung und ermöglicht eine möglichst platzsparende Ausbildung des Schalldämpfungsgehäuses. Das Etui ist vorzugsweise aus einem steifen oder halbsteifen Material, insbesondere aus einem Kunststoff, und der Deckel ist vorzugsweise aus einem weichen Material gefertigt.

**[0021]** Vorzugsweise ist das Schalldämpfungsgehäuse mittels der mindestens zwei elastischen Lager im Pumpaggregatträger gelagert. Vorzugsweise lagern die mindestens zwei elastischen Lager einerseits das Schalldämpfungsgehäuse im Pumpengehäuse und andererseits das Pumpaggregat innerhalb des Schalldämpfungsgehäuses. D.h. dieselben Lager weisen Doppelfunktionen auf, vorzugsweise weist jedes Lager auf zwei gegenüberliegenden Seiten entsprechende Flächen oder Ausbildungen auf. Dadurch reduziert sich die Anzahl der benötigten Lager. Die Lagerung ist genau definiert und optimiert. Zudem benötigt sie wenig Platz und ein Minimum an Bauteilen. Die Schalldämpfung ist verbessert, der Zusammenbau erleichtert und die Herstellungskosten minimiert.

**[0022]** Vorzugsweise ist das erste Lager ein Lagermodul in Form eines elastischen Einsatzelements, welches im Schalldämpfungsgehäuse gehalten ist und dieses durchsetzt. Das gesamte Einsatzelement ist vorzugsweise weich und einstückig hergestellt, beispielsweise aus Silikon oder TPE (thermoplastisches Elastomer). Das Einsatzelement dient als zweiseitiges Lager und verschliesst zudem das Schalldämpfungsgehäuse.

**[0023]** Vorzugsweise ist das zweite Lager ein Deckel oder ein Lagermodul in Form eines Teils eines Deckels des Schalldämpfungsgehäuses, wobei der gesamte Deckel elastisch ausgebildet ist. Vorzugsweise besteht er aus einem weichen Material, wie z.B. Silikon oder TPE. Durch Wahl der Form des Deckels lässt sich die Steifigkeit der Lagerstelle definieren. Der Deckel an sich kann das zweite Lager bilden oder zumindest Teile dieses Lagers bilden.

**[0024]** Einzelne Elemente lassen sich auch ohne die winklige Anordnung von Pumpaggregat und Energiespeicher bzw. ohne die Anordnung dieser zwei Bauteile auf einem gemeinsamen Pumpaggregatträger zu anderen erfindungsgemässen Saugpumpen zusammensetzen. Beispiele hierfür sind nachfolgend angegeben, welche als separate Erfindungen ebenfalls beansprucht sind. Die oben genannten bevorzugten Ausführungsformen, insbesondere die Merkmale der abhängigen Patentansprüche, lassen sich auch entsprechend mit diesen Beispielen ohne Verwendung aller Merkmale des Patentanspruchs 1 kombinieren.

**[0025]** In einer bevorzugten, ebenfalls als Erfindung beanspruchten Ausführungsform weist eine medizinische Saugpumpe ein Pumpengehäuse, ein im Pumpengehäuse angeordnetes Pumpaggregat zur Erzeugung eines Unterdrucks und mindestens ein erstes elastisches Lager und ein zweites elastisches Lager zur Lagerung des Pumpaggregats im Pumpengehäuse auf. Das erste elastische Lager befindet sich an einem ersten Ende des Pumpaggregats und das zweite elastische Lager befindet sich an einem zweiten, dem ersten Ende gegenüberliegenden Ende des Pumpaggregats. Dabei bildet das erste elastische Lager einen Vakuumanschluss. Diese Anordnung ist äusserst platzsparend und vermindert in optimaler Weise Vibrationen.

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**[0026]** In einer anderen, ebenfalls als Erfindung beanspruchten Ausführungsform weist eine medizinische Saugpumpe ein Pumpaggregat, ein Schalldämpfungsgehäuse zur Aufnahme des Pumpaggregats und ein Pumpengehäuse zur Aufnahme des Schalldämpfungsgehäuses auf. Das Schalldämpfungsgehäuse weist ein Etui zur Aufnahme des Pumpaggregats und einen das Etui verschliessenden Deckel auf. Der Deckel ist elastisch ausgebildet und er weist ein elastisches Lager zur Lagerung des Schalldämpfungsgehäuses im Pumpengehäuse auf. Diese Ausbildung ermöglicht einen einfachen Zusammenbau der Vorrichtung, da das Pumpaggregat lediglich in das Etui eingeschoben werden muss. Der elastische, insbesondere weiche Deckel verhindert auf optimale Weise Vibrationen und die Verbreitung von Körperschall.

**[0027]** In bevorzugten Ausführungsformen sind diese zwei Varianten miteinander kombiniert. D.h. das erste Lager bildet den Vakuumanschluss und das zweite Lager den Deckel.

**[0028]** In einer weiteren bevorzugten Ausführungsform, welche ebenfalls als separate Erfindung beansprucht wird, weist eine medizinische Saugpumpe ein Pumpaggregat, ein Schalldämpfungsgehäuse zur Aufnahme des Pumpaggregats und ein Pumpengehäuse zur Aufnahme des Schalldämpfungsgehäuses auf. Mindestens ein erstes und ein zweites elastisches Lager sind vorhanden, wobei mindestens eines dieser zwei elastischen Lager einerseits das Schalldämpfungsgehäuse im Pumpengehäuse lagert und andererseits das Pumpaggregat innerhalb des Schalldämpfungsgehäuses lagert. Vorzugsweise lagern beide elastischen Lager sowohl das Schalldämpfungsgehäuse bezüglich des Pumpengehäuses wie auch das Pumpaggregat bezüglich des Schalldämpfungsgehäuses. Das heisst, vorzugsweise sind beide elastischen Lager als Module ausgebildet, welche auf zwei gegenüberliegenden Seiten Lagerstellen bilden. Wie oben bereits erwähnt, ist hier die Lagerung sowie die Schalldämpfung optimiert und eine äusserst kompakte Bauweise ermöglicht. Diese Ausführungsform lässt sich beispielsweise erreichen, indem der Deckel und/oder der Vakuumanschluss als Lager ausgebildet sind und jeweils an den entsprechenden Stellen oder gesamthaft weich bzw. flexibel ausgebildet sind.

**[0029]** Weitere Ausführungsformen sind in den abhängigen Ansprüchen angegeben.

## KURZE BESCHREIBUNG DER ZEICHNUNGEN

**[0030]** Bevorzugte Ausführungsformen der Erfindung werden im Folgenden anhand der Zeichnungen beschrieben, die lediglich zur Erläuterung dienen und nicht einschränkend auszulegen sind. In den Zeichnungen zeigen:

- Figur 1 eine Explosionsdarstellung einer erfindungsgemässen Saugpumpe in einer ersten Ausführungsform;
- Figur 2 einen ersten Querschnitt durch die Saugpumpe gemäss Figur 1;
- Figur 3 einen zweiten Querschnitt durch die Saugpumpe gemäss Figur 1;
- Figur 4 eine Explosionsdarstellung eines Schalldämpfungsgehäuses mit einem Pumpaggregat der Saugpumpe gemäss Figur 1;
- Figur 5 eine perspektivische Darstellung eines Teils der Saugpumpe gemäss Figur 1 ohne Schalldämpfungselement;
- Figur 6 eine perspektivische Darstellung eines Teils der Saugpumpe gemäss Figur 1 mit Schalldämpfungselement;
- Figur 7 eine perspektivische Darstellung eines ersten Lagermoduls der Saugpumpe gemäss Figur 1;
- Figur 8 eine Ansicht des ersten Lagermoduls gemäss Figur 7 von oben;
- Figur 9a einen Querschnitt durch eine Anschlussöffnung des ersten Lagermoduls gemäss Figur 7 in einer ersten Variante;
- Figur 9b einen Querschnitt durch eine Anschlussöffnung des ersten Lagermoduls gemäss Figur 7 in einer zweiten Variante;
- Figur 9c einen Querschnitt durch eine Anschlussöffnung des ersten Lagermoduls gemäss Figur 7 in einer dritten Variante;
- Figur 10 eine perspektivische Darstellung eines zweiten Lagermoduls der Saugpumpe gemäss Figur 1;



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- Figur 11 eine Ansicht des zweiten Lagermoduls gemäss Figur 10 von oben;
- Figur 12a einen Querschnitt durch eine Anschlussöffnung des zweiten Lagermoduls gemäss Figur 11 in einer ersten Variante;
- Figur 12b einen Querschnitt durch eine Anschlussöffnung des zweiten Lagermoduls gemäss Figur 11 in einer zweiten Variante;
- Figur 12c einen Querschnitt durch eine Anschlussöffnung des zweiten Lagermoduls gemäss Figur 11 in einer dritten Variante und
- Figur 12d einen Querschnitt durch eine Anschlussöffnung des zweiten Lagermoduls gemäss Figur 11 in einer vierten Variante.

## BESCHREIBUNG BEVORZUGTER AUSFÜHRUNGSFORMEN

**[0031]** In Figur 1 ist ein bevorzugtes Ausführungsbeispiel einer erfindungsgemässen Saugpumpe dargestellt. Es handelt sich um eine Brustpumpe zum Abpumpen von menschlicher Muttermilch.

**[0032]** Die Saugpumpe weist ein erstes Pumpengehäuseteil 1, ein Schalldämpfungsgehäuse 2, einen Pumpaggregatträger 3, ein zweites Pumpengehäuseteil 4 sowie eine Abdeckung 5 auf. Im zusammengesetzten Zustand der Saugpumpe befindet sich das Schalldämpfungsgehäuse 2 innerhalb eines Pumpengehäuses, welches im Wesentlichen durch das erste Pumpengehäuseteil 1, das zweite Pumpengehäuseteil 4 und den dazwischen angeordneten und zwischen diesen zwei Teilen 1, 4 eingeklemmten Pumpaggregatträger 3 gebildet ist. Der Pumpaggregatträger 3 ist somit vorzugsweise von aussen als umlaufender Streifen erkennbar.

**[0033]** Das erste Pumpengehäuseteil 1 bildet den Boden der Saugpumpe. Es weist einen schalenförmigen Grundkörper 10 auf, dessen Unterseite, welche hier nach oben gerichtet ist, nahezu flach ausgebildet ist und eine Auflagefläche 11 bildet. Im Längsschnitt ist der Grundkörper 10 oval ausgebildet. Am Umfang des Grundkörpers 10 verteilt sind erste Verbindungselemente 12, vorzugsweise Schnappelemente oder andere bekannte Verbindungsmittel, angeordnet.

**[0034]** Das zweite Pumpengehäuseteil 4 weist eine im Wesentlichen ovale Grundplatte 40 und eine umlaufende Rinne 43 zur Aufnahme des Pumpaggregatträgers 3 auf. Auf der Grundplatte 40 sind die in Saugpumpen üblichen elektronischen Bauteile angeordnet. Sie sind hier lediglich schematisch dargestellt. Eine Steuer- und Elektronikeinheit ist mit dem Bezugszeichen 41 versehen. Über dem Umfang des zweiten Pumpengehäuseteils 4 verteilt sind zweite Verbindungselemente 42 angeordnet, die in den Rahmen 30 eingreifen.

**[0035]** Die Abdeckung 5 bildet zusammen mit dem zweiten Pumpengehäuseteil 4 das obere Teil des Pumpengehäuses, auch wenn diese Bauteile in dieser Darstellung unten angeordnet sind. Die Abdeckung 5 lässt sich auf dem zweiten Pumpengehäuseteil 4 befestigen. Sie weist vorzugsweise eine planparallele steife und ovale Deckplatte 50 mit einem Anzeige- und Betätigungsfenster 51 auf. Mittels des Anzeige- und Betätigungsfensters 51 lassen sich beispielsweise Benutzereingaben eingeben und die Funktionsweise der Saugpumpe optisch darstellen.

**[0036]** Der Pumpaggregatträger 3 ist vorzugsweise steif oder halbsteif ausgebildet. Vorzugsweise ist er aus einem Kunststoff gefertigt und vorzugsweise ist er einstückig. Er weist einen ovalen Rahmen 30 auf. An einer schmalen Stirnseite geht der Rahmen 30 in eine erhöhte Stirnwand 31 über, welche eine Durchgangsöffnung 33 aufweist. Die Rückseite der Stirnwand 31 ist mit einer ersten Lageraufnahme 36 versehen, welche die Durchgangsöffnung 33 umgibt. Verteilt über dem Umfang des Rahmens 30 sind dritte Verbindungselemente 32 vorhanden, die in das erste Pumpengehäuseteil 1 eingreifen, um das Pumpengehäuse zusammenzuhalten.

**[0037]** An dem der Durchgangsöffnung 33 gegenüberliegenden Ende des Rahmens 30 ist eine Energiespeicheraufnahme 35 angeordnet. Sie ist entsprechend der Form eines Energiespeichers 6 geformt. Der Energiespeicher 6 ist in diesem Beispiel eine zylinderförmige, wieder aufladbare Batterie. Andere Formen und Arten von Energiespeichern lassen sich auch verwenden. Die Energiespeicheraufnahme 35 ist als ein in der Figur 1 nach oben offener Kasten ausgebildet, wobei auf zwei gegenüberliegenden Seiten je ein Klammerelement 34 nach oben ragt. All diese Elemente sind vorzugsweise einstückig gemeinsam mit dem Rahmen 30 ausgebildet.

**[0038]** Benachbart zur Energiespeicheraufnahme 35 ist eine zweite Lageraufnahme 37 ausgebildet. Auch diese ist in diesem Beispiel als rechteckförmiger, nach oben offen ausgebildeter Kasten einstückig am Rahmen 30 angeformt. Das hintere, der Durchgangsöffnung 33 entgegengesetzte Ende des Rahmens 30 ist als Stromanschluss 38 ausgebildet. Dies ist in den Figuren 2 und 3 gut erkennbar.

**[0039]** Das Schalldämpfungsgehäuse 2 weist ein Etui 20 zur Aufnahme eines Pumpaggregats 7 auf. Das Etui 20 ist vorzugsweise steif oder halbsteif ausgebildet, insbesondere besteht es aus Kunststoff. Vorzugsweise weist es eine zur Pumpgehäuseform passende ovale abgerundete Form auf, wobei das Etui 20 im Bereich seiner Öffnung abgeschrägt ist. Die Abschrägung ist vorzugsweise geschwungen, so dass das Etui stufenförmig und auf einer Seite länger ausgebildet

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ist als auf der anderen Seite. Dies ist in Figur 1 gut erkennbar.

**[0040]** Dieser stufenförmige Rand ist mittels eines Deckels 21 geschlossen. Der Deckel 21 weist einen entsprechend geschwungen ausgebildeten, d.h. gebogenen Verschlusskörper 210 auf. Dieser geht vorzugsweise einstückig in einen annähernd zylinderförmigen Übergangsbereich 211 über. Der Durchmesser dieses Übergangsbereichs 211 entspricht vorzugsweise annähernd dem Durchmesser des längeren Bereichs des Etuis 20. Dem Übergangsbereich 211 folgt ein Verbindungsstift 212, an welchem sich ein zweites Lagermodul 23 anschliesst. Dies ist in den Figuren 2 und 3 gut erkennbar. Ein erstes Lagermodul 22 befindet sich am gegenüberliegenden Ende des Etuis 20 und wird weiter unten im Text ausführlicher beschrieben.

**[0041]** Das zweite Lagermodul 23 kann auf den Verbindungsstift 212 aufgesteckt sein. Vorzugsweise ist es jedoch einstückig mit diesem und dem gesamten restlichen Deckel 21 ausgebildet. Vorzugsweise ist der Deckel 21 mit dem zweiten Lager 23 elastisch ausgebildet. Insbesondere ist er weich. Vorzugsweise ist er aus einem Elastomer oder aus Silikon gefertigt.

**[0042]** Das Etui 20 weist im Bereich des ersten Lagermoduls 22 eine Ausnehmung 200 auf, welche im oberen Bereich ein Fenster 202 aufweist. In dieser Ausnehmung 200 ist ein Schalldämpfungselement 25, hier ein Schaumstoffwürfel, angeordnet.

**[0043]** In Figur 2 ist die Anordnung des Schalldämpfungsgehäuses 2 sowie des Energiespeichers 6 innerhalb des Rahmens 30 des Pumpaggregatträgers 3 gut erkennbar. Das Schalldämpfungsgehäuse 2, genauer das Etui 20, ist mittels des ersten Lagermoduls 22 in der ersten Lageraufnahme 36 gelagert. Das zweite Lagermodul 23 befindet sich in der zweiten Lageraufnahme 37 des Pumpaggregatträgers 3, so dass das Schalldämpfungsgehäuse 2 auch an diesem gegenüberliegenden Ende im Pumpaggregatträger 3 gelagert ist. Somit ist eine Zweipunktlagerung vorhanden.

**[0044]** Eine Durchgangsöffnung des ersten Lagermoduls 22, welche hier einen Vakuumanschluss 24 bildet, fluchtet mit der Durchgangsöffnung 33 des Pumpaggregatträgers 3, wie dies in Figur 3 gut erkennbar ist. Diese Durchgangsöffnung 33 bildet somit eine Aufnahme für einen Stecker eines Saugschlauchs, welcher zu einer Brusthaube zum Anlegen an die Mutterbrust führt. Stecker, Saugschlauch und Brusthaube sind hier nicht dargestellt. Sie sind jedoch aus dem Stand der Technik hinlänglich bekannt.

**[0045]** Wie in Figur 2 erkennbar ist, definiert das Etui 20 eine erste Längsachse  $L_1$ , welche mit der Längsmittelachse des Vakuumanschlusses 24 fluchtet. Der Energiespeicher 6 definiert eine zweite Längsachse  $L_2$ , welche in einem Winkel zu dieser ersten Längsachse  $L_1$  verläuft. Das zweite Lagermodul 23 definiert mit seiner Längsmittelachse eine dritte Längsachse  $L_3$ , welche parallel versetzt zur ersten Längsachse  $L_1$  verläuft.

**[0046]** Wie in den Figuren 2 und 3 gut erkennbar ist, ist der Platz innerhalb des Pumpaggregatträgers durch die Abschrägung des Etuis 20 sowie durch die schräge Anordnung des Energiespeichers 6 optimal genutzt und Leerräume sind weitgehend vermieden. Das Pumpengehäuse kann insgesamt sehr klein und kompakt ausgebildet werden. Es ist schallgedämpft und trotzdem steif und robust.

**[0047]** Die Anordnung des Pumpaggregats 7 innerhalb des Schalldämpfungsgehäuses 2 ist in Figur 3 dargestellt. Eine passende Explosionsdarstellung dazu findet sich in Figur 4.

**[0048]** Vorzugsweise entspricht das Pumpaggregat 7 im Wesentlichen dem in WO 2006/032156 A1 beschriebenen Pumpaggregat. Es lassen sich jedoch auch andere Formen und Ausgestaltungen in der erfindungsgemässen Vorrichtung verwenden. Vorzugsweise umfasst das Pumpaggregat jedoch einen Elektromotor sowie eine Pumpeinheit, insbesondere eine Membranpumpe, vorzugsweise eine Pumpkammer mit einer Pumpmembran.

**[0049]** Der Elektromotor ist in den Figuren mit dem Bezugszeichen 70 versehen, die Pumpeinheit mit dem Bezugszeichen 71. Die dritte Längsachse  $L_3$  des zweiten Lagermoduls 23 bildet die Flucht einer nicht dargestellten Motorachse des Elektromotors 70. Der Elektromotor 70 ist somit benachbart zum zweiten Lagermodul 23 angeordnet.

**[0050]** Die Pumpeinheit 71 weist eine Entlüftungsöffnung 710, eine Vakuumöffnung 711 sowie eine Belüftungsöffnung 712 auf. Dies ist in Figur 3 gut erkennbar.

**[0051]** Die Belüftungsöffnung 712 schliesst sich im zusammengebauten Zustand der Vorrichtung an eine Lufteinlassöffnung 201 an, welche sich in der Ausnehmung des Schalldämpfungsgehäuses 2 befindet. Diese Lufteinlassöffnung 201 ist in Figur 5 gut erkennbar. Sie ist vom Schalldämpfungselement 25 überdeckt, wie dies in Figur 6 dargestellt ist. Ein Fenster 202 ist aus spritzgusstechnischen Gründen im Etui 20 vorhanden.

**[0052]** Die Entlüftungsöffnung 710 führt in das Innere des Schalldämpfungsgehäuses 2, genauer des Etuis 20. Luft, welche über diese Entlüftungsöffnung 710 aus der Pumpeinheit 71 entweicht, verlässt das Schalldämpfungsgehäuse 2 über undichte Stellen wie beispielsweise über ein Aufnahmeelement 26 einer Steckverbindung mit einem Einsteckelement 213 des Deckels 21.

**[0053]** Die Vakuumöffnung 711 fluchtet mit einem Verbindungskanal 222 des ersten Lagermoduls 22, wie dies in Figur 4 erkennbar ist. Der Verbindungskanal 222 weist im Innern des ersten Lagermoduls 22 einen abgewinkelten, d.h. nicht geradlinigen Verlauf auf und endet im Vakuumanschluss 24, genauer in der darin vorhandenen Anschlussöffnung 225. Diese Anschlussöffnung 225 ist in Figur 7 gut erkennbar.

**[0054]** Das Pumpaggregat 7 ist mittels des ersten Lagermoduls 22 vakuumseitig im Schalldämpfungsgehäuse 2 gelagert und mittels des zweiten Lagermoduls 23, genauer des Deckels 21, motorseitig im Schalldämpfungsgehäuse 2



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gelagert. Der Deckel 21 ist hierfür lediglich auf dem Etui 20 aufzustecken und mit den bereits erwähnten Einsteckelementen 213 in die entsprechenden Aufnahmeelemente 26 einzustecken.

**[0055]** Das erste Lagermodul 22 ist nicht wie in Figur 4 dargestellt dem Etui 20 vorgelagert, sondern es befindet sich innerhalb des Etuis 20. Es lässt sich hierfür einfach über die gebogene Öffnung einschieben und durch eine stirnseitige Durchgangsöffnung 27 des Etuis 20 teilweise durchschieben. Ein Anschlusskörper 221 ragt aus der Öffnung heraus, ein Hals 226 ist freigestellt und ein Grundkörper 220 dichtet gegenüber dem Innenraum des Etuis 20 an dessen Innenseite. Diese Teile sind in den Figuren 7 und 8 gut erkennbar. Zur Befestigung des Grundkörpers 220 im Etui 20 dient vorzugsweise ein Klemmelement 223 in der Form einer federnden Zunge. Diese Zunge 223 dichtet ebenfalls gegenüber dem Innenraum des Etuis 20.

**[0056]** Der Grundkörper 220 weist einen Belüftungskanal 224 auf, welcher die Verbindung zwischen der Belüftungsöffnung 712 der Pumpeinheit 71 und der Lufteinlassöffnung 201 des Etuis 20 schafft.

**[0057]** Das gesamte erste Lagermodul 22 ist einstückig und vorzugsweise elastisch, insbesondere weich ausgebildet. Es bildet somit an zwei gegenüberliegenden Seiten Lagerstellen aus: auf einer ersten Seite zwischen dem Schalldämpfungsgehäuse 2 und dem Pumpaggregatträger 3 und somit dem Pumpengehäuse und auf einer gegenüberliegenden Seite zwischen dem Schalldämpfungsgehäuse 2 und dem Pumpaggregat 7, genauer der Pumpeinheit 71.

**[0058]** Auch der Deckel mit dem zweiten Lagermodul 23 ist einstückig und vorzugsweise elastisch, insbesondere weich ausgebildet. Auch dieses bildet somit an zwei gegenüberliegenden Seiten Lagerstellen aus: auf einer ersten Seite zwischen dem Schalldämpfungsgehäuse 2 und dem Pumpaggregatträger 3 und somit dem Pumpengehäuse und auf einer gegenüberliegenden Seite zwischen dem Schalldämpfungsgehäuse 2 und dem Pumpaggregat 7, genauer dem Elektromotor 70. Da der Pumpaggregatträger 3 Teil des äusseren Pumpengehäuses ist, erübrigt sich eine weitere Lagerung.

**[0059]** Die Schalldämpfung bzw. die Vibrationsdämpfung lässt sich weiterhin optimieren, indem die Anschlussöffnung 225 entsprechend gewählt wird. Bewährt haben sich Formen, wie sie in den Figuren 9a bis 9c dargestellt sind. Es ist der Hals 226 des ersten Lagermoduls 22 im Querschnitt gezeigt sowie die sich darin befindliche Anschlussöffnung 225. Die Querschnitte des Halses 226 sowie die Formen der Anschlussöffnung 225 lassen sich beliebig miteinander kombinieren. In Figur 9a ist der Hals 226 kreuzförmig und die Anschlussöffnung 225 ist rund. In Figur 9b sind der Hals 226 und die Anschlussöffnung 225 oval und in Figur 9c sind sie rund. Die Kombination gemäss Figur 9b ist am meisten bevorzugt.

**[0060]** In den Figuren 10 bis 12d ist der Deckel 21 mit dem zweiten Lagermodul 23 dargestellt. Er weist wie bereits beschrieben den gebogenen Verschlusskörper 210, den Übergangsbereich 211, den Verbindungsstift 212 und das zweite Lagermodul 23 auf. Das zweite Lagermodul 23 weist vorzugsweise einen quaderförmigen Rahmen mit darin verlaufenden Verbindungsstreben auf. Dadurch ist er elastisch und passt sich seiner zugehörigen zweiten Lageraufnahme 37 optimal an.

**[0061]** Im Übergangsbereich 211 sind vorzugsweise Kabeldurchführungen 214 in Form von Durchgangsöffnungen vorhanden, um den Elektromotor 70 über die Grundplatte 40 mit der Steuer- und Elektronikeinheit 41 zu verbinden. Am gebogenen Verschlusskörper 210 sind die Einsteckelemente 213 angeformt.

**[0062]** Die Schalldämpfung und die Lagerung lassen sich durch die Formgebung des Verbindungsstifts 212 zusätzlich optimieren. In den Figuren 12a bis 12 sind bevorzugte Varianten dargestellt. Vorzugsweise ist der Verbindungsstift 212 vollflächig, also massiv ausgebildet. Vorzugsweise ist er relativ steif.

**[0063]** In Figur 12a ist sein Querschnitt kreuzförmig, in Figur 12b rund, in Figur 12c rechteckig und in Figur 12d oval. Vorzugsweise ist er kreuzförmig.

**[0064]** Die erfindungsgemässe Saugpumpe ist klein und kompakt und weist eine gute Schalldämpfung auf.

## BEZUGSZEICHENLISTE

**[0065]**

1	erstes Pumpengehäuseteil	30	Rahmen
10	schalenförmiger Grundkörper	31	Stirnwand
11	Auflagefläche	32	drittes Verbindungselement
12	erstes Verbindungselement	33	Durchgangsöffnung
		34	Klammerelement
2	Schalldämpfungsgehäuse	35	Energiespeicheraufnahme
20	Etui	36	erste Lageraufnahme
200	Ausnehmung	37	zweite Lageraufnahme
201	Lufteinlassöffnung	38	Stromanschluss
202	Fenster		

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(fortgesetzt)

	21	Deckel	4	zweites Pumpengehäuseteil
	210	gebogener Verschlusskörper	40	Grundplatte
5	211	Übergangsbereich	41	Steuer- und Elektronikeinheit
	212	Verbindungsstift	42	zweites Verbindungselement
	213	Einsteckelement	43	Rinne
	214	Kabeldurchführungen		
10	22	erstes Lagermodul	5	Abdeckung
	220	Grundkörper	50	Deckplatte
	221	Anschlusskörper	51	Anzeige- und Betätigungsfenster
	222	Verbindungskanal		
	223	Klemmelement		
15	224	Belüftungskanal	6	Energiespeicher
	225	Anschlussöffnung		
	226	Hals	7	Pumpaggregat
	23	zweites Lagermodul	70	Elektromotor
20	24	Vakuumananschluss	71	Pumpeinheit
	25	Schalldämpfungselement	710	Entlüftungsöffnung
	26	Aufnahmeelement	711	Vakuümöffnung
	27	Durchgangsöffnung	712	Belüftungsöffnung
25	3	Pumpaggregatträger	L <sub>1</sub>	erste Längsachse
	L <sub>2</sub>	zweite Längsachse		
	L <sub>3</sub>	dritte Längsachse		

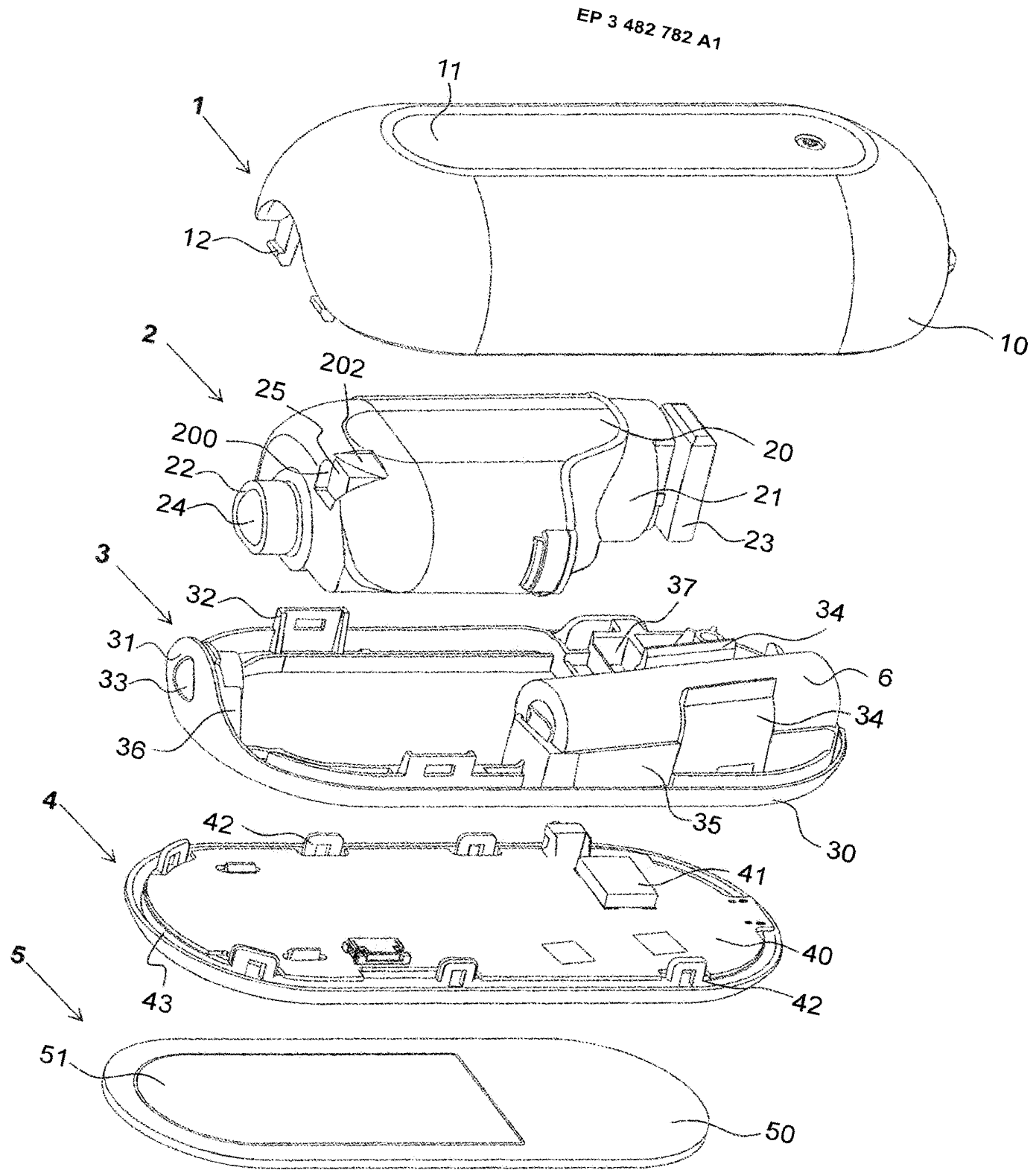
## 30 Patentansprüche

1. Motorbetriebene medizinische Saugpumpe mit einem Pumpaggregat zur Erzeugung eines Unterdrucks, mit einem Pumpaggregatträger (3) zur Halterung des Pumpaggregats (7) und mit einer Aufnahme (35) zur Aufnahme eines Energiespeichers (7), wobei das im Pumpaggregatträger (3) angeordnete Pumpaggregat (7) eine erste Längsachse (L<sub>1</sub>) definiert und die Aufnahme (35) eine zweite Längsachse (L<sub>2</sub>) definiert, **dadurch gekennzeichnet, dass** der Pumpaggregatträger (3) die Aufnahme (35) bildet und dass die zweite Längsachse (L<sub>2</sub>) in einem Winkel zur ersten Längsachse (L<sub>1</sub>) verläuft.
2. Motorbetriebene medizinische Saugpumpe nach Anspruch 1, wobei der Pumpaggregatträger (3) im Wesentlichen als Rahmen (30) ausgebildet ist und eine im Wesentlichen längliche abgerundete Grundform, insbesondere einen elliptische oder ovale Grundform, aufweist.
3. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 1 oder 2, wobei sie ein Pumpengehäuse mit einem ersten Pumpengehäuseteil (1) und einem zweiten Pumpengehäuseteil (4) umfasst und wobei der Pumpaggregatträger (3) zwischen dem ersten und dem zweiten Pumpengehäuseteil (1, 4) gehalten ist.
4. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 1 bis 3, wobei eine Lufteinlassöffnung (201) vorhanden ist, welche von einem Schalldämpfungselement (25) überdeckt ist.
5. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 1 bis 4, wobei mindestens zwei elastische Lager (22, 23) vorhanden sind zur Lagerung des Pumpaggregats (7) im Pumpaggregatträger (3).
6. Motorbetriebene medizinische Saugpumpe nach Anspruch 5, wobei mindestens ein erstes dieser Lager (22) einen Vakuumananschluss (24) bildet und mindestens ein zweites dieser Lager (23) an einem motorseitigen Ende des Pumpaggregats (7) und in Verlängerung einer Motorachse des Pumpaggregats (7) angeordnet ist.
7. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 5 oder 6, wobei genau zwei Lager (22, 23) vorhanden sind, welche entlang der ersten Längsachse (L<sub>1</sub>) an gegenüberliegenden Enden des Pumpaggregats

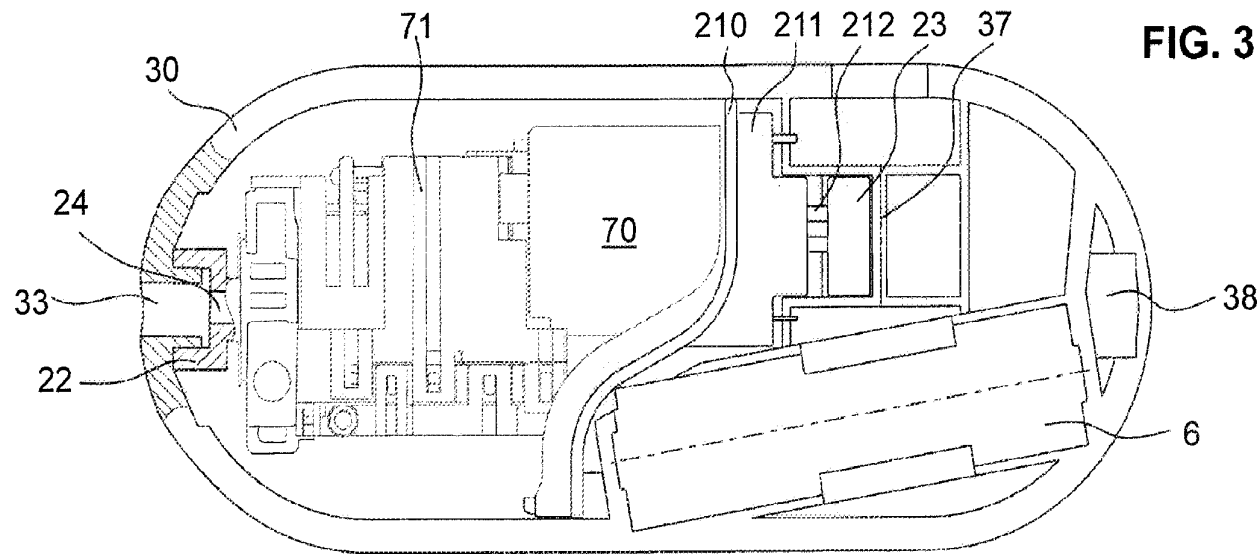
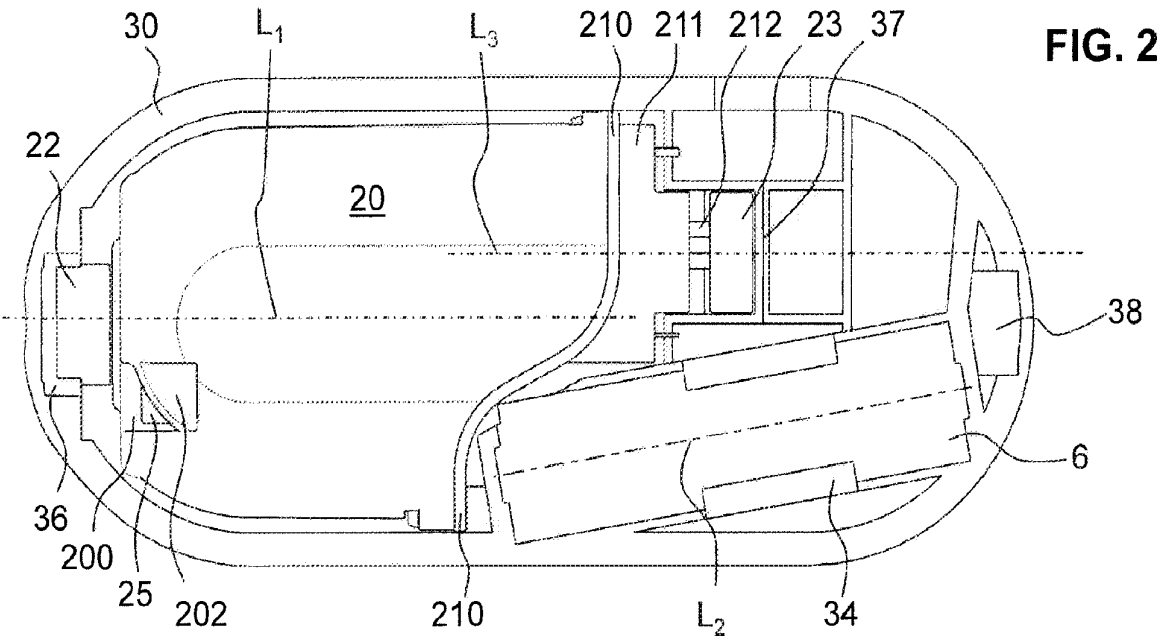
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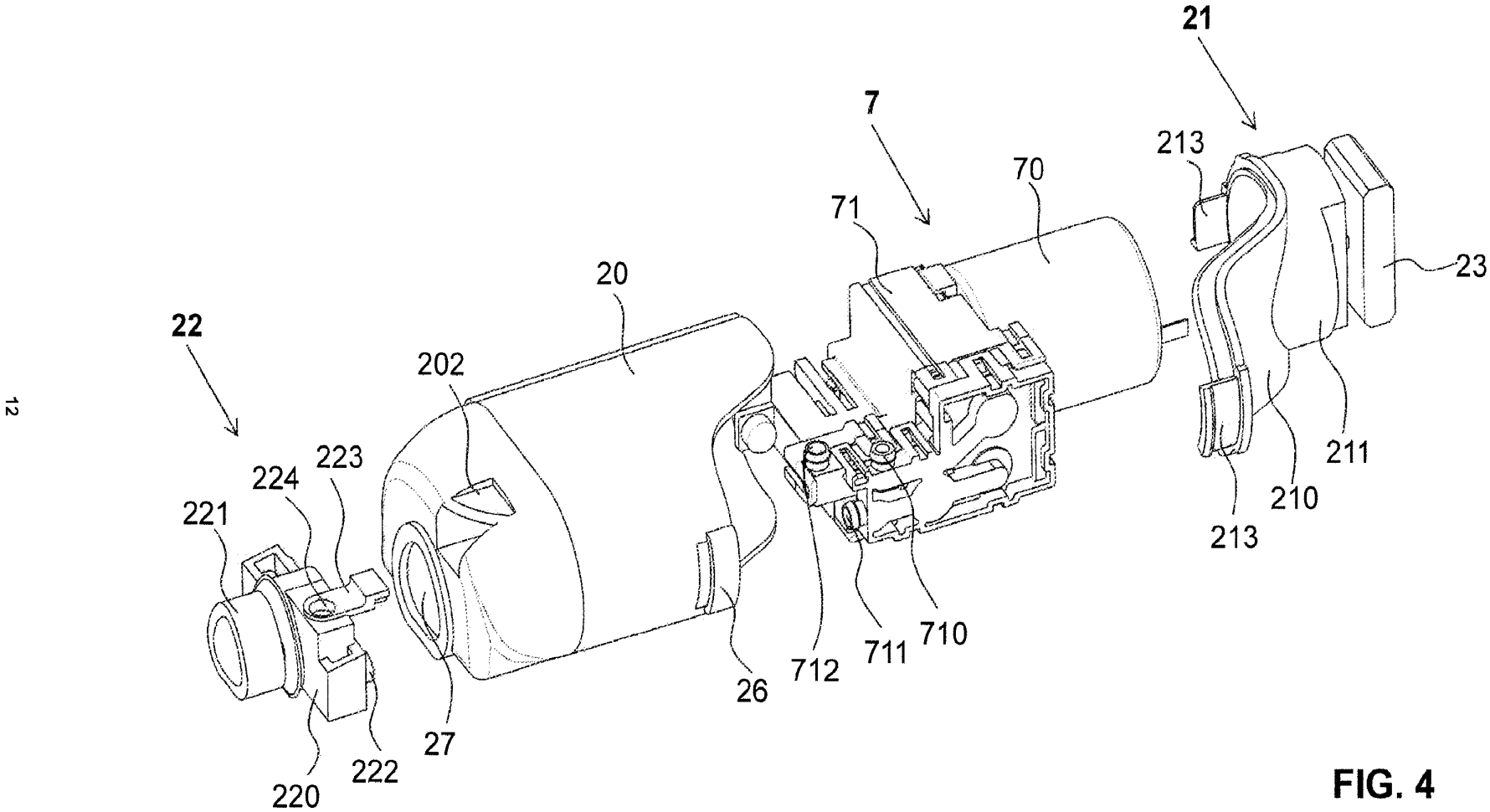
angeordnet sind.

8. Motorbetriebene medizinische Saugpumpe nach Anspruch 7, wobei die zwei Lager (22, 23) bezüglich der ersten Längsachse ( $L_1$ ) versetzt zueinander angeordnet sind.
9. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 1 bis 8, wobei das Pumpaggregat (7) in einem Schalldämpfungsgehäuse (2) angeordnet ist und das Schalldämpfungsgehäuse (2) im Pumpaggregatträger (3) gehalten ist.
10. Motorbetriebene medizinische Saugpumpe nach Anspruch 9, wobei das Schalldämpfungsgehäuse (2) ein Etui (20) mit einer Aufnahmeöffnung zur Aufnahme des Pumpaggregats (7) und einen das Etui (20) verschliessenden Deckel (21) aufweist, wobei der Deckel (21) gebogen ausgebildet ist.
11. Motorbetriebene medizinische Saugpumpe nach den Ansprüchen 5 und 9, wobei das Schalldämpfungsgehäuse (2) mittels der mindestens zwei elastischen Lager (22, 23) im Pumpaggregatträger (3) gelagert ist.
12. Motorbetriebene medizinische Saugpumpe nach Anspruch 11, wobei die mindestens zwei elastischen Lager (22, 23) einerseits das Schalldämpfungsgehäuse (2) im Pumpengehäuse (1, 3, 4) lagern und andererseits das Pumpaggregat (7) innerhalb des Schalldämpfungsgehäuses (2) lagern.
13. Motorbetriebene medizinische Saugpumpe nach Anspruch 12, wobei das erste Lager (22) ein elastisches Einsatzelement ist, welches im Schalldämpfungsgehäuse (2) gehalten ist und dieses durchsetzt.
14. Motorbetriebene medizinische Saugpumpe nach einem der Ansprüche 12 oder 13, wobei das zweite Lager (23) Teil eines Deckels (21) des Schalldämpfungsgehäuses (2) ist, wobei der gesamte Deckel (21) elastisch ausgebildet ist.
15. Medizinische Saugpumpe mit einem Pumpengehäuse (1, 3, 4), mit einem im Pumpengehäuse (1, 3, 4) angeordneten Pumpaggregat (7) zur Erzeugung eines Unterdrucks und mit mindestens einem ersten elastischen Lager (22) und einem zweiten elastischen Lager (23) zur Lagerung des Pumpaggregats (7) im Pumpengehäuse (1, 3, 4), wobei das erste elastische Lager (22) sich an einem ersten Ende des Pumpaggregats (7) befindet und das zweite elastische Lager (23) sich an einem zweiten, dem ersten Ende gegenüberliegenden Ende des Pumpaggregats (7) befindet, **dadurch gekennzeichnet, dass** das erste elastische Lager (22) einen Vakuumanschluss (24) bildet.
16. Medizinische Saugpumpe mit einem Pumpaggregat (7), einem Schalldämpfungsgehäuse (2) zur Aufnahme des Pumpaggregats (7) und mit einem Pumpengehäuse (1, 3, 4) zur Aufnahme des Schalldämpfungsgehäuses (2), **dadurch gekennzeichnet, dass** das Schalldämpfungsgehäuse (2) ein Etui (20) zur Aufnahme des Pumpaggregats (7) und einen das Etui (20) verschliessenden Deckel (21) aufweist, wobei der Deckel (21) elastisch ausgebildet ist und ein elastisches Lager (23) zur Lagerung des Schalldämpfungsgehäuses (2) im Pumpengehäuse (1, 3, 4) aufweist.
17. Medizinische Saugpumpe mit einem Pumpaggregat (7), einem Schalldämpfungsgehäuse (2) zur Aufnahme des Pumpaggregats (7) und mit einem Pumpengehäuse (1, 3, 4) zur Aufnahme des Schalldämpfungsgehäuses (2), **dadurch gekennzeichnet, dass** mindestens ein erstes und ein zweites elastisches Lager (22, 23) vorhanden sind, wobei mindestens eines dieser zwei elastischen Lager (22, 23) einerseits das Schalldämpfungsgehäuse (2) im Pumpengehäuse (1, 3, 4) lagert und andererseits das Pumpaggregat (7) innerhalb des Schalldämpfungsgehäuses (2) lagert.



**FIG. 1**





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FIG. 4

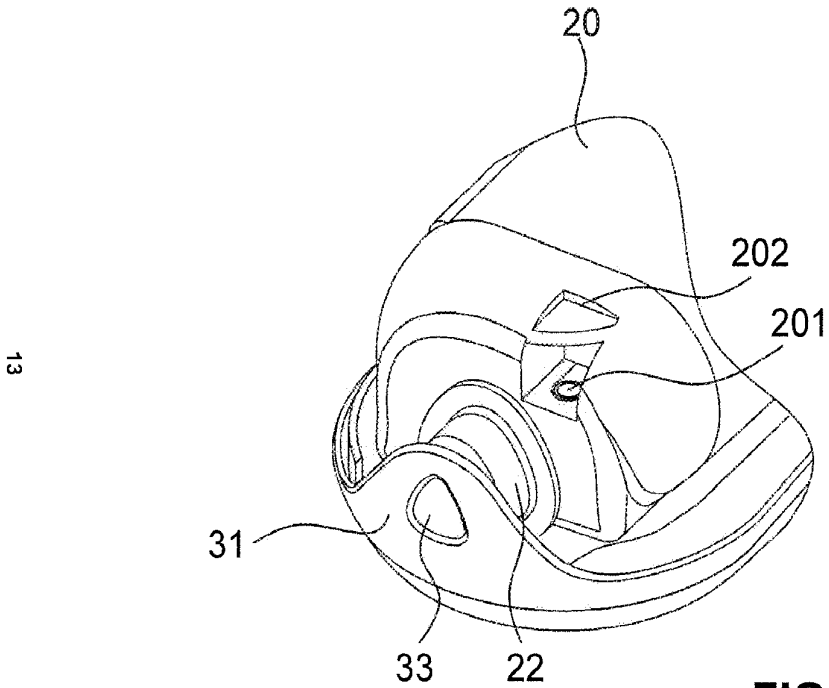


FIG. 5

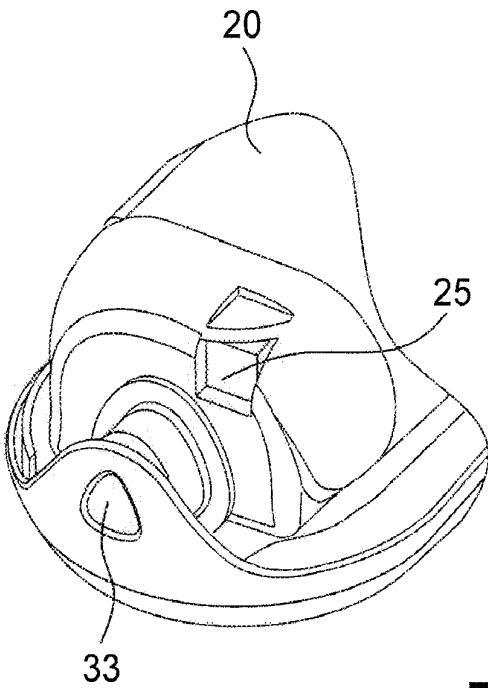


FIG. 6

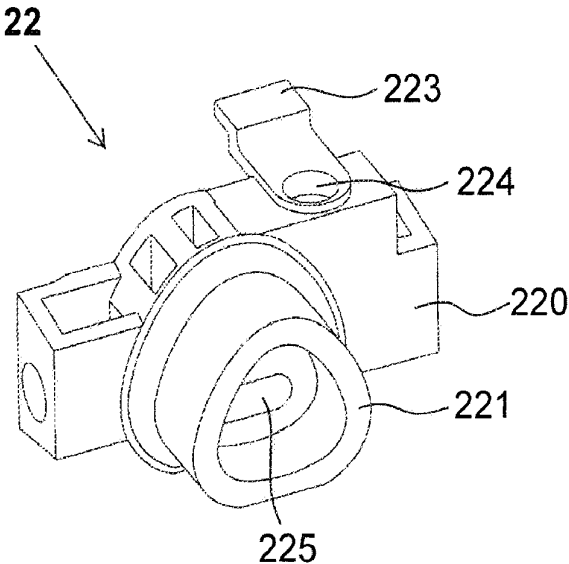


FIG. 7

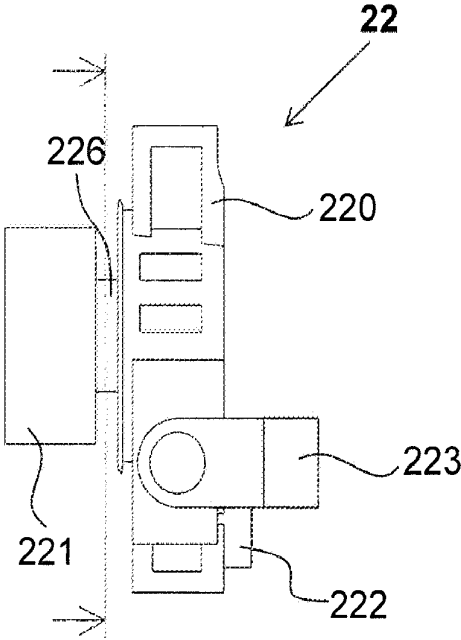


FIG. 8

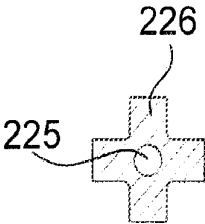


FIG. 9a

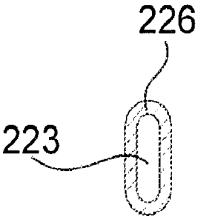


FIG. 9b

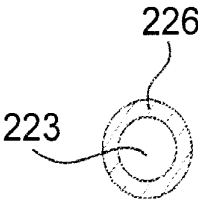


FIG. 9c

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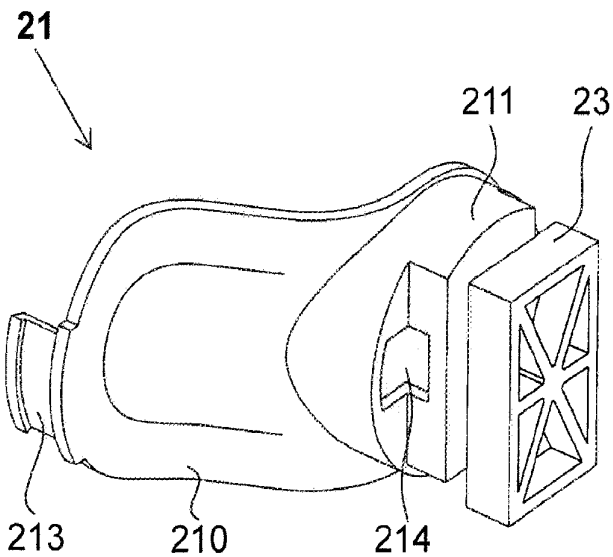


FIG. 10

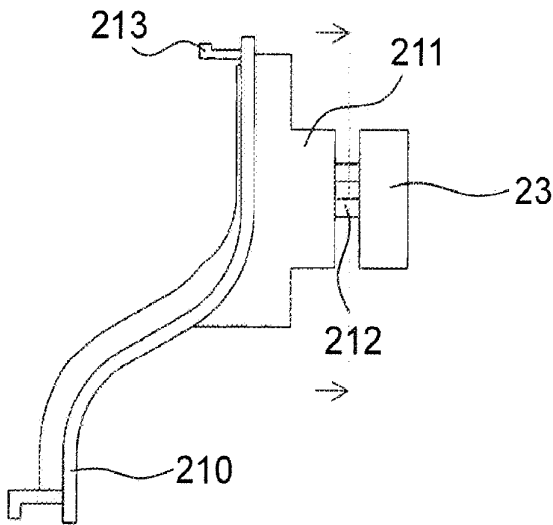


FIG. 11

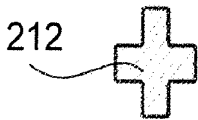


FIG. 12a

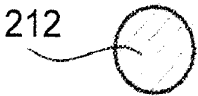


FIG. 12b



FIG. 12c



FIG. 12d

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## EUROPÄISCHER RECHERCHENBERICHT

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EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (IPC)
X	WO 2017/139437 A1 (EXPLORAMED NC7 INC [US]) 17. August 2017 (2017-08-17) * Absätze [0080] - [0083]; Abbildungen 2, 6A *	1-14	INV. A61M1/00
X	US 2015/025482 A1 (BEGIN MILES [US] ET AL) 22. Januar 2015 (2015-01-22) * Absätze [0044] - [0049]; Abbildung 2E *	1-14	
X	WO 2009/047524 A2 (TALLEY GROUP LTD [GB]; BYBORDI FARHAD [US]) 16. April 2009 (2009-04-16) * Seite 9, Zeilen 3-29; Abbildung 2B *	1-14	
X	WO 2016/103031 A1 (SMITH & NEPHEW [GB]) 30. Juni 2016 (2016-06-30) * Absätze [0155], [0211]; Abbildungen 13-14, 20 *	15	
			RECHERCHIERTE SACHGEBIETE (IPC)
			A61M
Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt			
Recherchenort Den Haag		Abschlußdatum der Recherche 18. Juni 2018	Prüfer Westsson, David
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☐ Nur ein Teil der Anspruchsgebühren wurde innerhalb der vorgeschriebenen Frist entrichtet. Der vorliegende europäische Recherchenbericht wurde für jene Patentansprüche erstellt, für die keine Zahlung fällig war, sowie für die Patentansprüche, für die Anspruchsgebühren entrichtet wurden, nämlich Patentansprüche:

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Siehe Ergänzungsblatt B

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☐ Da für alle recherchierbaren Ansprüche die Recherche ohne einen Arbeitsaufwand durchgeführt werden konnte, der eine zusätzliche Recherchegebühr gerechtfertigt hätte, hat die Recherchenabteilung nicht zur Zahlung einer solchen Gebühr aufgefordert.

☐ Nur ein Teil der weiteren Recherchegebühren wurde innerhalb der gesetzten Frist entrichtet. Der vorliegende europäische Recherchenbericht wurde für die Teile der Anmeldung erstellt, die sich auf Erfindungen beziehen, für die Recherchegebühren entrichtet worden sind, nämlich Patentansprüche:

☐ Keine der weiteren Recherchegebühren wurde innerhalb der gesetzten Frist entrichtet. Der vorliegende europäische Recherchenbericht wurde für die Teile der Anmeldung erstellt, die sich auf die zuerst in den Patentansprüchen erwähnte Erfindung beziehen, nämlich Patentansprüche:

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**1. Ansprüche: 1-14**

Motorbetriebene medizinische Saugpumpe mit einem Pumpaggregat zur Erzeugung eines Unterdrucks, mit einem Pumpaggregatsträger zur Halterung des Pumpaggregats und mit einer Aufnahme zur Aufnahme eines Energiespeichers, wobei das im Pumpaggregatsträger angeordnete Pumpaggregat eine erste Längsachse (L<sub>1</sub>) definiert und die Aufnahme eine zweite Längsachse (L<sub>2</sub>) definiert, dadurch gekennzeichnet, dass der Pumpaggregatsträger die Aufnahme bildet und dass die zweite Längsachse (L<sub>2</sub>) in einem Winkel zur ersten Längsachse (L<sub>1</sub>) verläuft.

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**2. Anspruch: 15**

Medizinische Saugpumpe mit einem Pumpengehäuse, mit einem im Pumpengehäuse angeordneten Pumpaggregat zur Erzeugung eines Unterdrucks und mit mindestens einem ersten elastischen Lager und einem zweiten elastischen Lager zur Lagerung des Pumpaggregats im Pumpengehäuse, wobei das erste elastische Lager sich an einem ersten Ende des Pumpaggregats befindet und das zweite elastische Lager sich an einem zweiten, dem ersten Ende gegenüberliegenden Ende des Pumpaggregats befindet, dadurch gekennzeichnet, dass das erste elastische Lager einen Vakuumanschluss bildet.

---

**3. Anspruch: 15**

Medizinische Saugpumpe mit einem Pumpengehäuse, mit einem im Pumpengehäuse angeordneten Pumpaggregat zur Erzeugung eines Unterdrucks und mit mindestens einem ersten elastischen Lager und einem zweiten elastischen Lager zur Lagerung des Pumpaggregats im Pumpengehäuse, wobei das erste elastische Lager sich an einem ersten Ende des Pumpaggregats befindet und das zweite elastische Lager sich an einem zweiten, dem ersten Ende gegenüberliegenden Ende des Pumpaggregats befindet, dadurch gekennzeichnet, dass das erste elastische Lager einen Vakuumanschluss bildet.

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**4. Anspruch: 16**

Medizinische Saugpumpe mit einem Pumpaggregat, einem Schalldämpfungsgehäuse zur Aufnahme des Pumpaggregats und mit einem Pumpengehäuse zur Aufnahme des Schalldämpfungsgehäuses, dadurch gekennzeichnet, dass das Schalldämpfungsgehäuse ein Etui zur Aufnahme des Pumpaggregats und einen das Etui verschliessenden Deckel aufweist, wobei der Deckel elastisch ausgebildet ist und ein

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**MANGELNDE EINHEITLICHKEIT  
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elastisches Lager zur Lagerung des Schalldämpfungsgehäuses  
im Pumpengehäuse aufweist.

---

5. Anspruch: 17

Medizinische Saugpumpe mit einem Pumpaggregat, einem  
Schalldämpfungsgehäuse zur Aufnahme des Pumpaggregats und  
mit einem Pumpengehäuse zur Aufnahme des  
Schalldämpfungsgehäuses, dadurch gekennzeichnet,  
dass mindestens ein erstes und ein zweites elastisches Lager  
vorhanden sind, wobei mindestens eines dieser zwei  
elastischen Lager einerseits das Schalldämpfungsgehäuse im  
Pumpengehäuse lagert und andererseits das Pumpaggregat  
innerhalb des Schalldämpfungsgehäuses lagert.

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## EP 3 482 782 A1

ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT  
ÜBER DIE EUROPÄISCHE PATENTANMELDUNG NR.

EP 17 20 1540

5 In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentdokumente angegeben.  
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am  
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

18-06-2018

10	Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
	WO 2017139437 A1	17-08-2017	KEINE	
15	US 2015025482 A1	22-01-2015	US 2015025482 A1 US 2017348469 A1	22-01-2015 07-12-2017
	WO 2009047524 A2	16-04-2009	KEINE	
20	WO 2016103031 A1	30-06-2016	AU 2015370582 A1 AU 2015370583 A1 AU 2015370584 A1 AU 2015370586 A1 CA 2971790 A1 CA 2971796 A1 CA 2971797 A1 CA 2971799 A1 CN 107249524 A CN 107249659 A CN 107249660 A CN 107708758 A EP 3236902 A2 EP 3237030 A1 EP 3237031 A1 EP 3237032 A2 JP 2018501054 A JP 2018501055 A JP 2018502682 A JP 2018507076 A SG 11201704250T A SG 11201704253V A SG 11201704254X A SG 11201704255W A US 2017368239 A1 US 2018133378 A1 WO 2016103031 A1 WO 2016103032 A1 WO 2016103033 A2 WO 2016103035 A2	15-06-2017 15-06-2017 15-06-2017 15-06-2017 30-06-2016 30-06-2016 30-06-2016 30-06-2016 13-10-2017 13-10-2017 13-10-2017 16-02-2018 01-11-2017 01-11-2017 01-11-2017 01-11-2017 18-01-2018 18-01-2018 01-02-2018 15-03-2018 28-07-2017 28-07-2017 28-07-2017 28-07-2017 28-12-2017 17-05-2018 30-06-2016 30-06-2016 30-06-2016 30-06-2016
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EPO FORM P0461

Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82

**EP 3 482 782 A1**

**IN DER BESCHREIBUNG AUFGEFÜHRTE DOKUMENTE**

*Diese Liste der vom Anmelder aufgeführten Dokumente wurde ausschließlich zur Information des Lesers aufgenommen und ist nicht Bestandteil des europäischen Patentdokumentes. Sie wurde mit größter Sorgfalt zusammengestellt; das EPA übernimmt jedoch keinerlei Haftung für etwaige Fehler oder Auslassungen.*

**In der Beschreibung aufgeführte Patentdokumente**

- WO 2006032156 A1 [0002] [0048]
- WO 2017157691 A1 [0004]
- WO 2015109934 A1 [0005]
- WO 2017140562 A1 [0006]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(c) and is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an



- 2 -

Jonathan O'TOOLE  
Application No.: 17/181,057

action that otherwise closes prosecution in the application. The required fee is provided through online credit card payment authorization in the amount of **\$104.00** in payment of the fee under 37 C.F.R. § 1.17(p).

A concise explanation of the relevance of the non-English language document(s) appears below in accordance with 37 C.F.R. § 1.98(a)(3).

Document **US6** (2020/0300237 A1) is submitted herewith as the English-language counterpart of document **FP1** (EP 3482782 A1).

A copy of document **FP1** is submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

Atty. Dkt. No. 4944.0120006

- 3 -

Jonathan O'TOOLE  
Application No.: 17/181,057

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: May 15, 2023

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20260440.1

Atty. Dkt. No. 4944.0120006

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**05/15/2023 03:27:41 PM ET**ATTORNEY DOCKET #  
**4944.0120006****Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 62088330

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

**Documents****TOTAL DOCUMENTS: 4**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2023-05-15-Transmittal-Form-sIDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	161 KB
2023-05-15-sIDS-Pleading-4944-0120006.pdf	3	Transmittal Letter	100 KB
2023-05-15-sIDS-Form-SB08-4944-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	147 KB
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FOR_1_EP3482782A1.pdf	21	Foreign Reference	442 KB

**Digest**

<b>DOCUMENT</b>	<b>MESSAGE DIGEST(SHA-512)</b>
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FOR_1_EP3482782A1.pdf	0A4794FB75138AF6B1F20955E40340F7D8470ADA20062553DF4C0F08FF07D8C66A0E17A8A211AB8592F5D46EFC71AE7573646AD8E14ABA1BF7CA3E1FD42142A9

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
Sheet	1	of	3	Attorney Docket Number	4944.0120006

**U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	US1	US20040024351A1	02-05-2004	GRETER; Andy et al.	
	US2	US20050228342A1	10-13-2005	YUEN; Yat Keung William	
	US3	US2015/0157775A1	06-11-2015	HU	
	US4	US20170173232A1	06-22-2017	CHANG; John Y. et al.	
	US5	US20180021491A1	01-25-2018	RIGERT; Mario et al.	
	US6	US20190209748A1	07-11-2019	ANALYTIS et al.	
	US7	US20210093761A1	04-01-2021	HWANG et al.	
	US8	US20230111110A1	04-13-2023	DE BECDELIEVRE et al.	
	US9	US20230143842A1	05-11-2023	O'TOOLE et al.	
	US10	US20230158215A1	05-25-2023	O'TOOLE et al.	
	US11	US4,673,388A	06-16-1987	SCHLENSOG et al.	
	US12	US9498565B2	11-22-2016	NOWROOZI et al.	
	US13	US11260151B2	03-01-2022	O'TOOLE; Jonathan et al.	
	US14	US11311654B2	04-26-2022	O'TOOLE; Jonathan et al.	
	US15	US11324866B2	05-10-2022	O'TOOLE; Jonathan et al.	
	US16	US11357894B2	06-14-2022	O'TOOLE; Jonathan et al.	
	US17	US11357893B2	06-14-2022	O'TOOLE; Jonathan et al.	
	US18	US11376352B2	07-05-2022	O'TOOLE; Jonathan et al.	
	US19	US11413380B2	08-16-2022	O'TOOLE; Jonathan et al.	

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>

Examiner Signature	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published		T <sup>2</sup>
	NPL1	Amended Complaint in Shenzhen Root Technology Co., Ltd. v. Chiaro Technology, Ltd., WDWA-2-23-cv-00631, filed June 2, 2023; 24 pages.		

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO

# SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT

**Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet	3	of	3
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005 /	Date (YYYY-MM-DD)	2023-06-22
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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## ELECTRONIC PAYMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**06/22/2023 05:46:14 PM ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 62321111

AUTHORIZED BY Yangbeini Wang

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE ADDRESS -

FIRST NAMED INVENTOR Jonathan O'TOOLE

### Payment Information

PAYMENT METHOD  
CARD / 1005PAYMENT TRANSACTION ID  
E20236LH47176578PAYMENT AUTHORIZED BY  
Jon Baitlon

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
2806	SUBMISSION OF AN INFORMATION DISCLOSURE STATEMENT	104.00	1	104.00
TOTAL AMOUNT:				\$104.00

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#### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

#### National Stage of an International Application under 35 U.S.C. 371



If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	February 22, 2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDERICKSON, Courtney B
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s)  <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Copy of NPL1.
<div>Remarks</div> <p>The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.</p> <p>Online Credit Card Payment Authorization in the Amount of \$104.00 to Cover: \$104.00 - Information Disclosure Statement fee</p>		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	June 22, 2023	Reg. No.	800,005

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UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**06/22/2023 05:46:14 PM ET**ATTORNEY DOCKET #  
**4944.0120006****Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

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FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

**Documents****TOTAL DOCUMENTS: 4**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
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2023-06-22-Transmittal-Form-sIDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	161 KB
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2023-06-22-sIDS-Pleading-4944-0120006.pdf	2	Transmittal Letter	99 KB
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2023-06-22-sIDS-Form-SB08-4944-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	149 KB
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NPL_1_Amended-Complaint.pdf	24	Non Patent Literature	304 KB
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## Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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2023-06-22-sIDS-Form-SB08-4944-0120006.pdf	D574E7D735F0C271DE3D94EC290C816EE17C1DD95203DA85B00427BFF1C390FB02662F6D22E21BDEC12E94D47A753FDDF54F5189A972936FD883437CAFAB4CEA
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

### **New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

### **National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

### **New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(c) and is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an

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Jonathan O'TOOLE  
Application No.: 17/181,057

action that otherwise closes prosecution in the application. The required fee is provided through online credit card payment authorization in the amount of **\$104.00** in payment of the fee under 37 C.F.R. § 1.17(p).

Copy of document **NPL1** is submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

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Date: June 22, 2023

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Atty. Dkt. No. 4944.0120006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: O'TOOLE *et al.*

Applicant: Chiaro Technology Limited

Application No.: 17/181,057

Filing Date: February 22, 2021

Title: **BREAST PUMP SYSTEM**

Confirmation No.: 4690

Art Unit: 3783

Examiner: FREDRICKSON, Courtney B.

Atty. Docket: 4944.0120006

**Amendment and Reply Under 37 C.F.R. § 1.111**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

*Mail Stop Amendment*

Commissioner:

In reply to the Office Action dated **March 30, 2023**, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

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Chiaro Technology Limited  
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### *Amendments to the Claims*

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A breast pump device comprising:
  - a housing comprising:
    - a battery, and
    - a pump configured to generate negative air pressure;
  - a breast shield of a plurality of interchangeable breast shields, each of the plurality of interchangeable breast shields having a different size and being configured to slide in and out of the housing, the breast shield comprising a breast flange and a nipple tunnel comprising a side wall and a front end, and ~~a guide line~~ fit lines, wherein the breast shield is transparent or optically clear; and
  - a milk container configured to be attached to and removed from the housing,
  - wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast, and
  - wherein the ~~guide line is~~ fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved ~~define the spacing of the nipple from the side wall of the nipple tunnel.~~
2. (Canceled)
3. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is rigid.
4. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is a dishwasher safe, plastic breast shield.

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5. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to be attached using magnets to the housing.
6. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast.
7. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to present, in use, a single continuous surface to a nipple and a breast.
8. (Previously Presented) The breast pump device of claim 1, wherein the breast flange and the nipple tunnel are integrally formed.
9. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to be generally symmetrical about a center-line running from a top to a bottom of the breast shield when positioned upright for normal use.
10. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to slide into the housing with a single push action.
11. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to slide out from the housing, together with a membrane that is configured to prevent milk from flowing into the pump.
12. (Previously Presented) The breast pump device of claim 1, wherein the milk container is rigid.

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13. (Previously Presented) The breast pump device of claim 1, wherein the milk container is an optically clear, dishwasher safe, plastic milk container.
14. (Previously Presented) The breast pump device of claim 1, wherein the milk container is configured to attach to a lower part of the housing and forms a base of the breast pump device.
15. (Previously Presented) The breast pump device of claim 1, wherein the milk container is configured to magnetically attach to the housing.
16. (Currently Amended) The breast pump device of claim 1, wherein the ~~guide line is~~ fit lines are configured to run parallel along one or more sides of the nipple tunnel.
17. (Previously Presented) The breast pump device of claim 1, wherein the nipple tunnel comprises an air hole or passage, and wherein the pump is configured to transfer negative air pressure into the nipple tunnel via the air hole or passage.
18. (Previously Presented) The breast pump device of claim 1, wherein the nipple tunnel comprises on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container.
19. (Previously Presented) The breast pump device of claim 1, wherein the pump comprises one or more piezo air pumps.
20. (Previously Presented) The breast pump device of claim 1, wherein the housing further comprises a Universal Serial Bus (USB) charging socket.

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21. (Previously Presented) The breast pump device of claim 1, wherein the housing comprises a left or right breast selector or toggle switch that, when selected for a particular pumping session, is configured to send data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast.
22. (Previously Presented) The breast pump device of claim 1, wherein the housing is configured to be shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra.
23. (Canceled)
24. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg.
25. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device comprises a sensor that is configured to directly measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.
26. (Canceled)
27. (Canceled)
28. (Previously Presented) The breast pump device of claim 1, wherein the pump is configured to deliver in excess of 400 mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.

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29. (Previously Presented) The breast pump device of claim 1, wherein the pump is a lightweight air pump that enables a total mass of the breast pump device, unfilled with milk, to be less than 250 gm.
30. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device is configured to make less than 30 dB noise at maximum power and less than 25 dB at normal power, against a 20 dB ambient noise.
31. (Previously Presented) A kit, comprising:
  - the breast pump device of claim 1; and
  - the plurality of interchangeable breast shields.
32. (Currently Amended) The kit of claim 31, wherein ~~each of the plurality of interchangeable breast shields comprises the~~ fit lines in a nipple tunnel of that breast shield that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.
33. (Previously Presented) The breast pump device of claim 1, wherein the battery is a rechargeable battery, and wherein the housing further comprises:
  - a power charging circuit configured to control the charging of the rechargeable battery, and
  - control electronics configured to be powered by the rechargeable battery.
34. (Previously Presented) The breast pump device of claim 1, wherein a length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same.

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Chiaro Technology Limited  
Application No. 17/181,057

### ***Remarks***

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1, 3–22, 24, 25, and 28–34 are pending in the application. Claims 1 is an independent claim. Claims 1, 16, and 32 are amended. These changes introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Office reconsider and withdraw all outstanding objections and rejections.

### ***Allowable Subject Matter***

Applicant thanks Examiner Fredrickson for indicating that claim 28 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Office Action, 28.

### ***Claim Objections***

Claim 1 is objected to for informalities. Office Action, 3.

Without agreeing to the propriety of the objection, relevant language of claim 1 is deleted. Therefore, the objection is now moot. Applicant respectfully requests that the objection be withdrawn.

### ***Rejections under 35 U.S.C. § 112***

Claims 1, 3–22, 24, 25, and 28–34 are rejected under 35 U.S.C. § 112(b) as allegedly being indefinite. Office Action, 3–4.

Without agreeing to the propriety of the rejections, relevant language of claim 1 is deleted, thereby rendering the rejection of claim 1 moot, and claim 1 is amended to recite, “the breast shield comprising a breast flange and a nipple tunnel comprising a side wall and a front end, and *fit lines*,” thereby providing antecedent basis for claim 32. Accordingly, Applicant respectfully requests that the § 112 rejections of claims 1, 3–22, 24, 25, and 28–34 be withdrawn.

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***Rejections under 35 U.S.C. § 103***

**Independent claim 1**

Claims 1, 3, 6–8, 10, 11, 14, 16–18, 22, 24, 31, 32, and 34 are rejected under 35 U.S.C. § 103 as unpatentable over U.S. Applicant No. 2008/0275386 to Myers, in view of EP 2502640 to Cook et al., and in further view of U.S. Patent Applicant Publication No. 2002/0198489 to Silver et al. Office Action, 5–10.

Claims 1, 6–10, 14, 17, 18, 20, 22, 31, 32, and 34 are rejected under 35 U.S.C. § 103 as unpatentable over U.S. Patent Applicant Publication No. 2013/0023821 to Khalil et al. in view of Myers, in view of Cook, and further in view of Silver. Office Action, 11–16.

Without agreeing to the propriety of the rejections, claim 1 is amended and now recites, “wherein the fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.” The applied references do not teach or suggest at least this feature of claim 1.

The Office acknowledges that Myers, Cook, and Khalil do not teach that the nipple tunnel comprises a guide line configured to define the spacing of the nipple from the side wall of the nipple tunnel, and only relies on Silver for this feature. Office Action, 6–8 and 12–14.

Silver discloses a breastshield 1095 formed with a skeletal frame, and the skeletal frame comprises a series of stiffening longitudinally extending ribs 1160, 1164, and 1166. Silver, ¶¶ [0200]–[0201] and FIG. 28. The Office interprets ribs 1160, 1164, and 1166 to allegedly correspond to the recited guide line. Office Action, 8. However, Silver is silent on how ribs 1160, 1164, and 1166 can define a correct spacing of the nipple from the side of the nipple tunnel or assist with correct nipple alignment. Furthermore, Silver does not disclose that ribs 1160, 1164, and 1166 are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as recited in amended claim 1.

Accordingly, amended claim 1 and its dependent claims would not have been obvious over the applied references. Applicant respectfully requests reconsideration and withdrawal of the § 103 rejections of claims 1, 3, 6–10, 11, 14, 16–18, 20, 22, 24, 31, 32, and 34.

Dependent claims

Claim 4 is rejected under 35 U.S.C. § 103 as unpatentable over Myers in view of Cook, in view of Silver, as applied to claim 1 above, in view of U.S. Patent Applicant Publication No. 2016/0296682 to Phillips et al., and further in view of U.S. Patent Applicant Publication No. 2005/0228342 to Yuen. Office Action, 10–11.

Claim 5 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2018/0333523 to Chang et al. Office Action, 16–17.

Claims 12 and 13 are rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of Phillips. Office Action, 17–18.

Claim 15 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2007/0228059 to Karsan. Office Action, 18–19.

Claim 19 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2012/0277636 to Blondheim et al. Office Action, 19–20.

Claims 20 and 21 are rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2014/0378895 to Barak. Office Action, 20–21.

Claim 25 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2016/0220743 to Guthrie et al. Office Action, 21–22.

Claim 29 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent No. 6,227,936 to Mendoza. Office Action, 22–23.

Claim 30 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent Applicant Publication No. 2009/0281485 to Baker et al. Office Action, 23–24.

Claim 33 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers, in view of Cook, in view of Silver, as applied to claim 1 above, and further in view of U.S. Patent No. 5,542,921 to Meyers et al. Office Action, 24.

Each of claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33 depends from and adds features to independent claim 1. The additionally applied references do not overcome the deficiencies of Myers, Cook, Silver, and Khalil as discussed above. Accordingly, claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33 would not have been obvious over the applied references. Applicant respectfully requests reconsideration and withdrawal of the § 103 rejections of claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33.

### ***Double Patenting Rejection***

Claims 1, 3–22, 24, 25, and 29–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers, Cook, and Silver. Office Action, 26–30.

- U.S. Applicant No. 17/203050 (U.S. Patent No. 11357893)
- U.S. Applicant No. 17/203079 (U.S. Patent No. 11376352)
- U.S. Applicant No. 17/203216 (U.S. Patent No. 11357894)
- U.S. Applicant No. 17/203259 (U.S. Patent No. 11324866)
- U.S. Applicant No. 17/203327 (U.S. Patent No. 11413380)



Claims 1, 3–22, 24, 25, and 28–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers, Cook, and Silver. Office Action, 30–34.

- U.S. Applicant No. 17/203109 (U.S. Patent No. 11260151)
- U.S. Applicant No. 17/203313 (U.S. Patent No. 11311654)

Claims 1, 3–22, 24, 25, and 29–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers, Cook, and Silver. Office Action, 34–38.

- U.S. Applicant No. 17/203150
- U.S. Applicant No. 17/203179
- U.S. Applicant No. 17/203292
- U.S. Applicant No. 17/203355
- U.S. Applicant No. 17/203384
- U.S. Applicant No. 17/203397
- U.S. Applicant No. 17/203418

Applicant respectfully requests that the currently asserted double patenting rejections be held in abeyance until the claimed subject matter is otherwise deemed allowable. After analyzing the final allowed claim scope, Applicant will consider filing a terminal disclaimer if necessary to overcome any obviousness-type double patenting rejections.

### ***Conclusion***

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Office reconsider and withdraw all presently outstanding objections and rejections. A full and complete reply has been made to the outstanding Office Action and, as such, the present application is in

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Chiaro Technology Limited  
Application No. 17/181,057

condition for allowance. If the Office believes, for any reason, that personal communication will expedite prosecution of this application, the Office is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: June 30, 2023

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Atty. Dkt. No. 4944.0120006

Document Description: Transmittal Letter

PTO/SB/21 (07-09)

Approved for use through 12/31/2020. OMB 0851-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDRICKSON, Courtney B.
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance Communication to TC
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
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<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation	<input type="checkbox"/> Status Letter
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Signature	/Yangbeini Wang #800,005/	
Printed name	Yangbeini Wang	
Date	June 30, 2023	Reg. No. 800,005

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www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**06/30/2023 10:56:14 AM ET**ATTORNEY DOCKET #  
**4944.0120006****Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Rolonda Lee

PATENT CENTER # 62369354

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

**Documents****TOTAL DOCUMENTS: 4**

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2023-06-30-Transmittal-Form-4944-0120006.PDF		1	Transmittal Letter	162 KB
2023-06-30-Amendment-Reply-111-4944-0120006.PDF		12	-	153 KB
2023-06-30-Amendment-Reply-111-4944-0120006-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	117 KB
2023-06-30-Amendment-Reply-111-4944-0120006-CLM.pdf	(2-6)	5	Claims	81 KB

2023-06-30-Amendment- Reply-111-4944-0120006- REM.pdf	(7-12)	6	Applicant Arguments/Remarks Made in an Amendment	140 KB
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## Digest

### DOCUMENT

### MESSAGE DIGEST(SHA-512)

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2023-06-30-Amendment-Reply- 111-4944-0120006.PDF	D9CE5CF94EE165AC04CF761F0987FA9EC7279B9DC53D90506B81B1323A99D85543D36FEB4C768ABBF8136607C8C76FD402EFB2CD151C33BD68F1E42DFE985583
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2023-06-30-Amendment-Reply- 111-4944-0120006-CLM.pdf	406F2101C60741B14BA57E750378F3AE1F3CE962D3B0261335F94C99CEC9D70D43B0CB93AF1334D0D9BDF A9CA68FD002EC48065FAFFE9C93B9817B94B2B194E1
2023-06-30-Amendment-Reply- 111-4944-0120006-REM.pdf	A4CEF82F872A82584B06C05286A7463418D928BE04C6943A621E90C78D14D35CF9F6DE18256FF63FEA23398DFE430AA64CEC6789702264B164647C771BF271F6

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

#### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

#### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875				Application or Docket Number 17/181,057		Filing Date 02/22/2021		<input type="checkbox"/> To be Mailed			
ENTITY: <input type="checkbox"/> LARGE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> MICRO											
<b>APPLICATION AS FILED - PART I</b>											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)			
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A					
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A					
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A					
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$50 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$240 =					
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL					
<b>APPLICATION AS AMENDED - PART II</b>											
		(Column 1)		(Column 2)		(Column 3)					
<b>AMENDMENT</b>	06/30/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0			x \$40 =		0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0			x \$192 =		0	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
								TOTAL ADD'L FEE		0	
		(Column 1)		(Column 2)		(Column 3)					
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=			x \$0 =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=			x \$0 =			
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
								TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.								SLIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/LISA R WRIGHT/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".											
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.											

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690
26111	7590	10/12/2023	EXAMINER	
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.			FREDRICKSON, COURTNEY B	
1101 K Street, NW			ART UNIT	
10th Floor			PAPER NUMBER	
WASHINGTON, DC 20005			3783	
			NOTIFICATION DATE	
			DELIVERY MODE	
			10/12/2023	
			ELECTRONIC	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

e-office@sternekessler.com



**Office Action Summary****Application No.**

17/181,057

**Applicant(s)**

O'TOOLE et al.

**Examiner**

COURTNEY FREDRICKSON

**Art Unit**

3783

**AIA (FITF) Status**

Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 30June2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.

2a) ☒ This action is **FINAL**.

2b) ☐ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims\***

5) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are pending in the application.

5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

6) ☐ Claim(s) \_\_\_\_ is/are allowed.

7) ☒ Claim(s) 1,3-22,24-25 and 28-34 is/are rejected.

8) ☐ Claim(s) \_\_\_\_ is/are objected to.

9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 22February2021 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a) ☒ All b) ☐ Some\*\* c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

3) ☐ Interview Summary (PTO-413)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)

Paper No(s)/Mail Date \_\_\_\_.

4) ☐ Other: \_\_\_\_.

Paper No(s)/Mail Date \_\_\_\_.

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## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Response to Amendment***

This office action is responsive to the amendment filed on June 30, 2023. As directed by the amendment: claims 1, 16, and 32 have been amended. Thus, claims 1, 3-22, 24, 25, and 238-34 are presently pending in this application.

Applicant's amendments to the Specification, Drawings, and Claims have overcome each and every objection and 112(b) rejections previously set forth in the Non-Final Office Action mailed March 30, 2023.

### ***Response to Arguments***

Applicant's arguments filed June 30, 2023 have been fully considered but they are not persuasive.

Applicant argues on pg. 8 of the Remarks that "*Silver is silent on how ribs 1160, 1164, and 1166 can define a correct spacing of the nipple from the side of the nipple tunnel or assist with correct nipple alignment. Furthermore, Silver does not disclose that ribs 1160, 1164, and 1166 are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved*". The examiner respectfully disagrees and notes that the claim is not directed towards guide lines which define a correct spacing of the nipple from the side of the nipple tunnel. The claims are merely drawn to fit lines which are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved. The examiner further notes that "correct nipple alignment" is

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also not further defined. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In the case of Silver, the longitudinal ribs (1160, 1164, and 1166 in fig. 28) are capable of being positioned so that the ribs are alongside the outside of the nipple when the shield is fitted onto a breast when the nipple is “correctly” aligned with this correct alignment being the nipple received in the nipple tunnel. Additionally, the ribs of Silver are fully configured to define a correct spacing of the nipple from the side of the nipple tunnel and to signify to a user that the shield is sized for a nipple of the user. As seen in fig. 28, the ribs are shown to be positioned interior to the shield (see dotted lines in fig. 28). A user would be able to see (Myers discloses the shield is transparent, paragraph 65) and feel the ribs to ascertain if the shield is too small. For example, if a user feels the ribs against the breast/nipple, this could signal to a user that the shield is improperly sized for their nipples. For this reason, the rejection is maintained.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

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A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

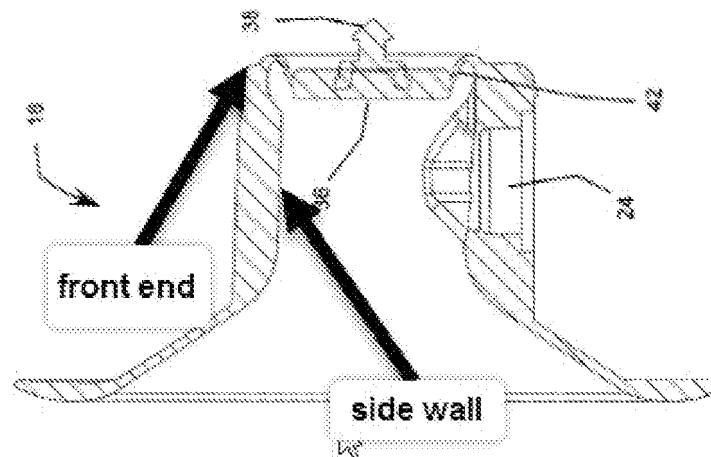
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1, 3, 6-8, 10, 11, 14, 16-18, 22, 24, 31, 32, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers (US 20080275386) and in further view of Cook (EP 2502640) and in further view of Silver (US 20020198489).**

**Regarding claim 1**, Myers discloses a breast pump device comprising:

(i) a housing (outer housing 16 in fig. 1) comprising (a) a battery (AA battery 51 in fig. 10), and (b) a pump configured to generate negative air pressure (motor 54 in fig. 10);

(ii) a breast shield (breast cup 16 in fig. 1) being configured to slide in and out of the housing (paragraph 58 discloses that the cup “clicks” into place within the housing; paragraph 42 discloses the breast cup being removable), the breast shield comprising a breast flange (outer flange area 50 in fig. 5) and a nipple tunnel (nipple tunnel 46 in fig. 5) comprising a side wall and a front end (see below), in which the breast shield is transparent or optically clear (paragraph 65); and



(iii) a milk container that is configured to be attached to and removed from the housing (collection bag 28 is shown to be operatively attached to the housing and is physically engaged to the bottom portion of the housing).

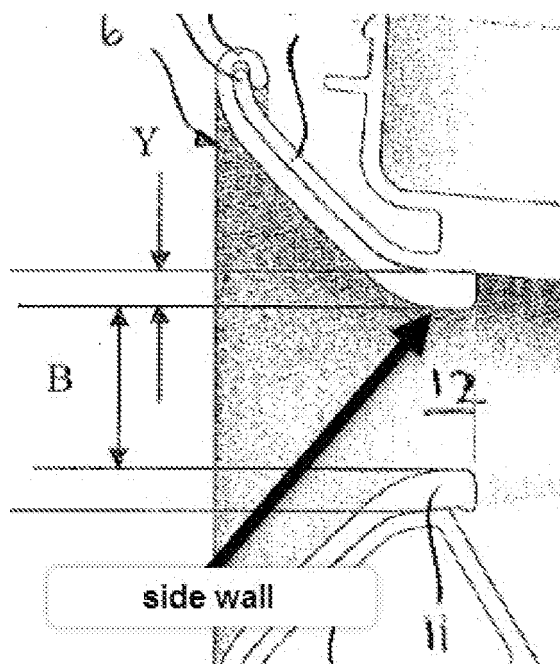
However, Myers does not teach or disclose the breast shield being of a plurality of interchangeable breast shields each of the plurality of interchangeable breast shields having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel comprises fit lines, wherein the fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different

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wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved

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(longitudinal ribs 1164 and 1166 in fig. 28 are capable of being positioned so they run alongside the outside of the nipple when the nipple is correctly aligned in the nipple tunnel, see response to arguments above). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of modified Myers to include fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

**Regarding claim 3**, in the modified device of Myers, Myers discloses the breast shield is rigid (paragraph 47 discloses the nipple tunnel, which is part of the breast shield, is rigid).

**Regarding claim 6**, in the modified device of Myers, Myers discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Myers is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

**Regarding claim 7**, in the modified device of Myers, Myers discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 9A/B shows a singular inner surface which would extend from the nipple to the breast).

**Regarding claim 8**, in the modified device of Myers, Myers discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 5 shows a singular item).

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**Regarding claim 10**, in the modified device of Myers, Myers discloses the breast shield is configured to slide into the housing with a single push action (paragraph 58 discloses the shield can click into place).

**Regarding claim 11**, in the modified device of Myers, Myers discloses the breast shield is configured to slide out from the housing, together with a membrane that prevents milk from flowing into the pump (flange top 36 in fig. 9A).

**Regarding claim 14**, in the modified device of Myers, Myers discloses milk container attaches to a lower part of the housing (fig. 1 shows a part of the collection bag attached to the bottom part of the housing 16) and forms a base of the breast pump device (fig. 1).

**Regarding claim 16**, in the modified device of Myers, Silver discloses the fit lines are configured to run parallel along one or more sides of the nipple tunnel (fig. 28 shows the lines 1166 and 1164 are longitudinal lines).

**Regarding claim 17**, in the modified device of Myers, Myers discloses the nipple tunnel includes an air hole or passage (24 in fig. 9A), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (paragraph 52).

**Regarding claim 18**, in the modified device of Myers, Myers discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container (outlet 24 in fig. 9A).

**Regarding claim 22**, in the modified device of Myers, Myers discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 1; paragraph 40).



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**Regarding claim 24**, in the modified device of Myers, Myers discloses the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg (paragraph 72).

**Regarding claim 31**, modified Myers teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 32**, modified Myers teaches the fit lines in a nipple tunnel of that breast shield (Silver discloses longitudinal ribs 1164 and 1166 in fig. 28) that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (since Myers discloses that the breast shield is transparent in paragraph 65, a user would be able to assess the spacing between the ribs and the nipple, see response to arguments above).

**Regarding claim 34**, in the modified device of Myers, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 4 is/are rejected under 35 U.S.C. 103 as being unpatentable over Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Phillips (US 20160296682), as evidenced by Yuen (US 20050228342).**

**Regarding claim 4**, modified Myers teaches all of the claimed limitations set forth in claim 1, as discussed above. Myers further teaches the breast shield is made from plastic (paragraph 40 discloses the breast cup being made from silicone, which is

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a type of plastic, as evidenced by Yuen in paragraph 24). However, modified Myers does not teach or disclose breast shield is dishwasher safe.

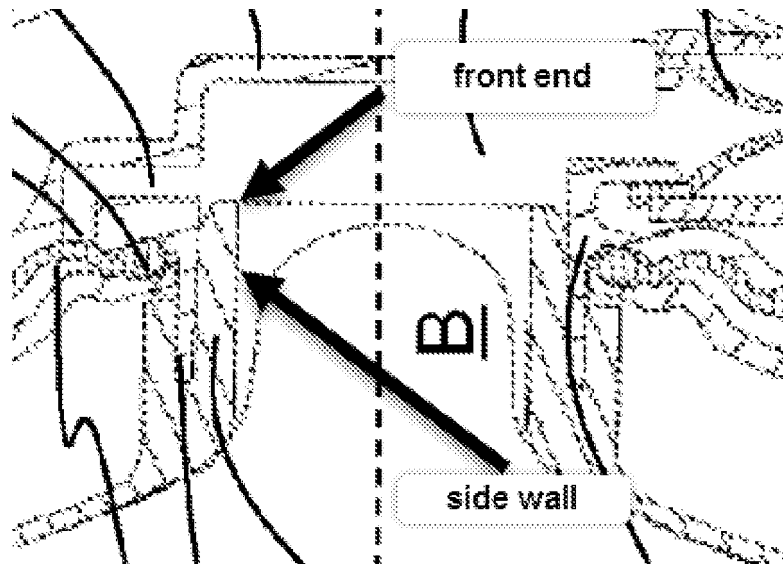
Phillips teaches a breast pump device (fig. 1) comprising a breast shield (110 in fig. 1). Phillips further teaches that the shield can be washed in a dishwasher (paragraph 60). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Myers to be dishwasher safe for the purpose of enabling the shield to be cleaned in the dishwasher for reuse, as taught by Phillips (paragraph 60).

**Claims 1, 6-10, 14, 17-18, 20-22, 31, 32, and 34 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil (US 20130023821) in view of Myers (US 20080275386) and in further view of Cook and in further view of Silver.**

**Regarding claim 1**, Khalil discloses a breast pump device comprising:

(i) a housing (6' and 6" form a housing as shown in fig. 9) that includes (a) a power source (paragraph 32 discloses the power source integrated into the housing), and (b) a pump generating negative air pressure (vacuum pump 81 in fig. 10);

(ii) a breast shield (breast interface 1 in fig. 11) being configured to slide in and out of the housing (breast interface 1 is configured to slide in/out from the housing by attaching/detaching the lip 11 to the flange 62 of the housing as shown in fig. 4), the breast shield made up of a breast flange (base part 12 in fig. 4) and a nipple tunnel (stub 10 in fig. 4) comprising a side wall and a front end (see below); and



(iii) a milk container that is configured to be attached to and removed from the housing (milk collection container 7' in fig. 11; paragraph 69 discloses the container being releasably connected to the housing part 6').

However, Khalil does not teach or disclose the power source being a battery and the breast shield being transparent or optically clear and being of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel comprises fit lines, wherein the fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.

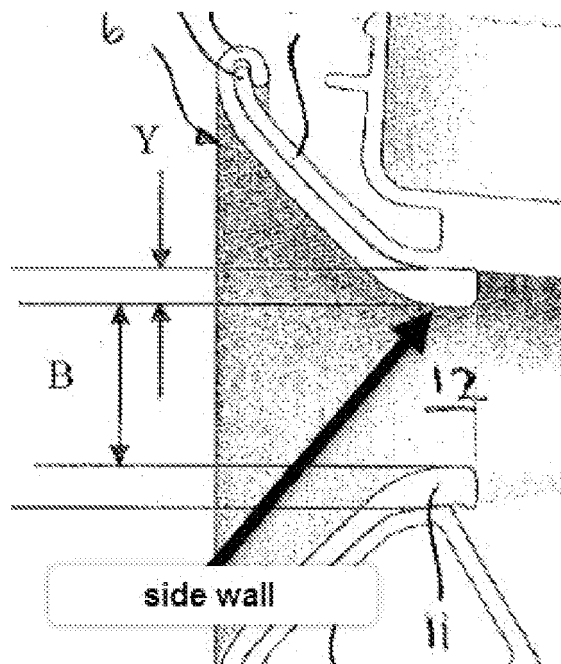
Myers teaches a similar breast pump system (fig. 1) having a housing (outer housing 16 in fig. 1) which comprises a battery (battery 52 in fig. 10) and a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent). Therefore, it would have been obvious to one of ordinary skill

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before the effective filing date of the claimed invention to have modified the housing to include a battery, as taught by Myers, for the purpose of providing power to the device and to have made the breast shield transparent to enable a user to view the condition of a nipple (paragraph 65).

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see below) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple).



Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality

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of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved (longitudinal ribs 1164 and 1166 in fig. 28 are capable of being positioned so they run alongside the outside of the nipple when the nipple is correctly aligned in the nipple tunnel, see response to arguments above). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of modified Myers to include fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

**Regarding claim 6**, in the modified device of Khalil, Khalil discloses the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast (the shield of Khalil is functionally capable of being rotated smoothly around a nipple since the claim does not require that the shield be fully latched onto the nipple for this rotation to occur).

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**Regarding claim 7**, in the modified device of Khalil, Khalil discloses the breast shield presents, in use, a single continuous surface to a nipple and a breast (fig. 11).

**Regarding claim 8**, in the modified device of Khalil, Khalil discloses the breast shield integrates the breast flange and the nipple tunnel as a single item (fig. 11).

**Regarding claim 9**, in the modified device of Khalil, Khalil discloses the breast shield is generally symmetrical about a centre-line running from a top to a bottom of the breast shield when positioned upright for normal use (fig. 11).

**Regarding claim 10**, in the modified device of Khalil, Khalil discloses the breast shield is configured to slide into the housing with a single push action (the shield of Khalil is functionally capable of being pushed into the housing so that the nipple tunnel is located in the housing).

**Regarding claim 14**, in the modified device of Khalil, Khalil discloses milk container attaches to a lower part of the housing and forms a base of the breast pump device (fig. 9).

**Regarding claim 16**, in the modified device of Khalil, Silver discloses the fit lines are configured to run parallel along one or more sides of the nipple tunnel (fig. 28 shows the lines 1166 and 1164 are longitudinal lines).

**Regarding claim 17**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes an air hole or passage (opening 13 in fig. 3), and the pump transfers negative air pressure into the nipple tunnel via the air hole or passage (figs. 4 and 5).

**Regarding claim 18**, in the modified device of Khalil, Khalil discloses the nipple tunnel includes on a lower surface of the nipple tunnel an opening through which

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expressed milk flows into the milk container (opening 13 in fig. 3 is considered to be on a “lower” surface of the nipple tunnel since “lower” is not further defined; see fig. 5).

**Regarding claim 22**, in the modified device of Khalil, Khalil discloses the housing is shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra (fig. 9).

**Regarding claim 31**, modified Khalil teaches a kit comprising the breast pump device of claim 1 (see discussion above); and the plurality of interchangeable breast shields (fig. 2a/b of Cook).

**Regarding claim 32**, modified Myers teaches the fit lines in a nipple tunnel of that breast shield (Silver discloses longitudinal ribs 1164 and 1166 in fig. 28) that are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel (since Myers discloses that the breast shield is transparent in paragraph 65, a user would be able to assess the spacing between the ribs and the nipple, see response to arguments above).

**Regarding claim 34**, in the modified device of Khalil, Cook discloses length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same (paragraph 43).

**Claim 5 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Chang (US 20180333523).**

**Regarding claim 5**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast shield is configured to attach using magnets to the housing.

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Chang teaches a substantially similar self-contained breast pump system (breast pump system 10 in fig. 1A) having a breast shield (flange 14 in fig. 1A) attached to a housing (housing 12 in fig. 1A) and configured to attach to the housing using one or more magnets (paragraph 108 discloses the shield uses magnets 118 attached to the shield to determine if the shield is properly attached to the housing). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the shield of modified Khalil to be configured to attach using magnets to the housing since Chang teaches this configuration provides a safeguard such that the system will not operate unless all components are fully connected (paragraph 108).

**Claims 12 and 13 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Phillips (US 20160296682).**

**Regarding claim 12**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Although it appears based on fig. 11 of Khalil that the container would be rigid, modified Khalil does not explicitly teach or disclose this limitation.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is substantially rigid (paragraph 57 discloses the container being made from Tritan; pg. 21 of Applicant's specification discloses that Tritan is a polycarbonate material, which is a known rigid material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be



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made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Regarding claim 13**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further discloses the milk container is an optically clear, plastic container (paragraph 69 discloses the container is made of plastic like cover 6" and is transparent in its entirety). However, Khalil does not explicitly teach or disclose the milk container is dishwasher safe.

Phillips teaches a breast pump system (fig. 1) comprising a milk collection container ("collection container" 120 in fig. 1) which is dishwasher safe (paragraph 57 discloses the container being made from Tritan; pg. 21, lines 13-18 of Applicant's specification discloses that Tritan a dishwasher safe material). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the container of modified Khalil to be made of Tritan for the purpose of enabling the container to maintain its strength when a vacuum is applied, as taught by Phillips (paragraph 57).

**Claim 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Karsan (US 20070228059).**

**Regarding claim 15**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the milk container is configured to magnetically attach to the housing.

Khalil teaches that the milk container latches to the housing by a locking lug (paragraph 69 discloses a locking lug formed on the container latches engages into a

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corresponding recess). Karsan teaches a container (1 in fig. 1) having a case (2 in fig. 3) and a base (fig. 3) which are releasably held together (paragraph 51 discloses the connection being releasable) via a latch mechanism (5 and 6 in fig. 3). Karsan further teaches that the latching mechanism is embodied as a lug and recess (5 and 6, respectively in fig. 3; paragraph 65) but may alternatively be embodied as a magnetic means so that the two components may be magnetically latched (paragraph 65).

In Applicant's invention, Applicant uses the magnets to removably secure the milk container to the housing. Thus, Karsan is reasonably pertinent to the problem faced by the inventor since Karsan teaches using magnets as a removable latching connection between two components. As Karsan teaches that the magnetic means (paragraph 65) are functional equivalents to a locking lug and recess (paragraph 65), it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have substituted the locking lug/recess configuration of Khalil with the magnetic means, as taught by Karsan. The substitution would have resulted in providing an equivalent secure attachment of the milk container to the housing.

**Claim 19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Blondheim (US 20120277636).**

**Regarding claim 19**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump comprises one or more piezo air pumps.

Blondheim is directed towards a breast pump device (fig. 1) which comprises an air pump (66 in fig. 6). Blondheim further teaches that the air pump can be a

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piezoelectric pump (paragraph 36). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the pump of modified Khalil to be a piezoelectric pump, as taught by Blondheim for the purpose of rendering the pump small in size (paragraph 36).

**Claims 20 and 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Barak (US 20140378895).**

**Regarding claim 20**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing further includes a Universal Serial Bus (USB) charging socket.

Barack is directed towards a breast pump device (fig. 1) which comprises a housing which houses a pump (fig. 1 shows a pump 20 which would necessarily have some sort of housing since it is disclosed to have a USB port and a user interface). Barack further teaches a USB charging socket (USB port 34 in fig. 1; paragraph 45). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include the USB charging socket, as taught by Khalil, for the purpose of enabling the device to interface with an external memory (paragraph 45).

**Regarding claim 21**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the housing includes a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track

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pumping sessions, to indicate whether that particular session is associated with a left or a right breast.

Barack teaches a breast pump device (fig. 1) which has a control electronics (controller 22 in fig. 1) and a control interface (user interface 30 in fig. 1) that is user selectable to indicate or record if milk is being expressed from the left or right breast (paragraph 43) and that, when selected for a particular pumping session, sends data to a connected application, running on a device, such as a smartphone, that tracks pumping sessions, to indicate whether that session is associated with the left or the right breast (paragraph 46 discloses transmitting via transceiver the parameters that have been entered at the user interface 30 to a remote device; paragraph 43 discloses that one parameter entered at the user interface is which breast is selected).

Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the housing of modified Khalil to include a left or right breast selector or toggle switch, that, when selected for a particular pumping session, sends data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast, as taught by Barack. This modification would enable a user to track which parameters are best suited for each breast to optimize pumping, as taught by Barack (paragraphs 8 and 43).

**Claim 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Guthrie (US 20160220743).**

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**Regarding claim 25**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device includes a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.

Guthrie is directed towards a breast pump device comprising a sensor (detector 607 in fig. 6B) that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container (paragraph 63 discloses that the emitter 606 and the detector 607 operate to detect light reflecting off the opaque surface of the milk). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device to include a sensor that is configured to directly measures the measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container, as taught by Guthrie, for the purpose of measuring volume of milk pumped (paragraph 54).

**Claim 29 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, and further in view of Mendoza (US 6227936).**

**Regarding claim 29**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the pump is a

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lightweight air pump that enables the total mass of the breast pump system, unfilled with milk, to be less than 250gm.

Mendoza teaches a bra which is designed to support a breast pump to allow the mother's hands to remain free (1:8-12). Mendoza further discloses that the bra must be able to support up to 8 ounces when the pump is full (1:58-62). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the system of modified Khalil to be a lightweight air pump that enables the total weight of the system, unfilled with milk, to be less than 250gm, as taught by Mendoza since Mendoza teaches that a lightweight system is crucial for enabling the system to be supported by a bra.

**Claim 30 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, in further view of Baker (US 20090281485).**

**Regarding claim 30**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above, but does not teach or disclose the breast pump device makes less than 30dB noise at maximum power and less than 25dB at normal power, against a 20dB ambient noise.

Baker is directed towards a device for removing fluid from a body (fig. 6) using a vacuum pump embodied as a motor (motor 9 in fig. 6; paragraph 243). Baker further teaches that the device makes less than 20 decibel of noise at full power (paragraph 121) by sound proofing the walls of the housing and by adding a counter balance to the motor (paragraph 144). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the device of

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modified Khalil to have the device make less than 20 dB of noise during maximum power for the purpose of making the device for discrete and comfortable for the user and others around the user.

**Claim 33 is/are rejected under 35 U.S.C. 103 as being unpatentable over Khalil in view of Myers in view of Cook and in further view of Silver, as applied to claim 1 above, in further view of Meyers (US 5542921).**

**Regarding claim 33**, modified Khalil teaches all of the claimed limitations set forth in claim 1, as discussed above. Khalil further teaches control electronics (“control elements and a display” in paragraph 51) which would be powered by the battery (the power source of Khalil is understood to power the device).

However, Khalil does not teach or disclose the battery to be rechargeable and the housing further including a power charging circuit for controlling the charging of the rechargeable battery.

Meyers is directed to a breast pump device (fig. 1) comprising a battery configured to be recharged (9:50-52 discloses recharging the batteries) and a power charging circuit for controlling the charging of the rechargeable battery (“circuit” in 9:50-52). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the battery of modified Khalil to be rechargeable and to have incorporated a power charging circuit for controlling the charging of the rechargeable battery, as taught by Meyers to enable the batteries to be reused.

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).



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The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit [www.uspto.gov/patent/patents-forms](http://www.uspto.gov/patent/patents-forms). The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to [www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp](http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp).

**Claims 1, 3-22, 24, 25, 29-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the issued patents below in view of Myers, Cook, Silver, and the teachings below (see table).**

- **17203050 (US Patent 11357893)**
- **17203079 (US Patent 11376352)**
- **17203216 (US Patent 11357894)**
- **17203259 (US Patent 11324866)**
- **17203327 (US Patent 11413380)**

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of

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interchangeable breast shields is placed onto a breast; and the nipple tunnel having fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable. Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to

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provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved (longitudinal ribs 1164 and 1166 in fig. 28 are capable of being positioned so they run alongside the outside of the nipple when the nipple is correctly aligned in the nipple tunnel, see response to arguments above). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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7	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25	Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 28-34 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following US Patents in view of Myers, Cook and the teachings below (see table).**

- **17203109 (US Patent 11260151)**
- **17203313 (US Patent 11311654)**

Claim 1 of the issued patent claims all of the features claimed in reference claim 1 except in that claim 1 of the patent does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel having fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.

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Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches

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that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved (longitudinal ribs 1164 and 1166 in fig. 28 are capable of being positioned so they run alongside the outside of the nipple when the nipple is correctly aligned in the nipple tunnel, see response to arguments above). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.

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8	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9	Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11	Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13	Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15	Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16	Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19	Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
20	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21	Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22	Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.



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24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
28	18 ('151 patent), 13 ('654 patent)	
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

**Claims 1, 3-22, 24, 25, 29-34 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 1 of the following copending applications in view Myers, Cook and the teachings below.**

- 17203150
- 17203179
- 17203292
- 17203355
- 17203384
- 17203397

- **17203418**

Claim 1 of the reference claim claims all of the features claimed in reference claim 1 except in that claim 1 of the reference claim does not claim a breast shield of a plurality of interchangeable breast shields each being transparent or optically clear and having a different size and being configured to slide in and out of the housing, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast; and the nipple tunnel having fit lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved.

Myers teaches a breast pump system (fig. 1) having a breast shield (breast cup 18 in fig. 2) which is transparent (paragraph 65 discloses the silicone breast cup being transparent) and configured to slide in and out of the housing (paragraph 42 discloses the cup being removable). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be transparent to enable a user to view the condition of a nipple (paragraph 65) and to be enabled to slide in and out of the housing for the purpose of removing the breast shield after use.

Cook teaches a plurality of interchangeable breast shields (inserts 1 and 4 in fig. 1a/b) which each comprise a flange (frustoconical shaped wall 5 in fig. 1a/b) and nipple tunnel (cylindrical section 9 and 11 in fig. 1a/b). Cook further teaches that the shields are configured to provide a different spacing of a nipple from a side wall of the nipple tunnel (see above with respect to rejection of claim 1) when each of the plurality of

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interchangeable breast shields are placed onto a breast (paragraph 42 discloses that the nipple tunnels each have different wall thicknesses which would alter the inner diameter 10/12 of the shields which would provide different spacings between the side wall of the nipple tunnel and the nipple). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the breast shield to be of a plurality of interchangeable breast shields each having a different size, the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast. Cook teaches that this modification would render the device useful to a greater population since Cook teaches that nipple size can vary across the population (paragraph 5).

Silver teaches a breast shield (inner shield part 1094 in fig. 28) which comprises a flange (conical section 1120 in fig. 28) and a nipple tunnel (tubular extension 1126 in fig. 28). Silver further teaches that the nipple tunnel has fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved (longitudinal ribs 1164 and 1166 in fig. 28 are capable of being positioned so they run alongside the outside of the nipple when the nipple is correctly aligned in the nipple tunnel, see response to arguments above). Therefore, it would have been obvious to one of ordinary skill before the effective filing date of the claimed invention to have modified the nipple tunnel of the reference claim to include fit lines configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved, as taught by Silver, since Silver teaches that these lines reduce the tendency of the breast shield to expand or contract along the longitudinal length (paragraph 202).

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App Claim	Ref Claim	Teaching
1	1	see discussion above
3		Myers teaches this limitation above. It would have been obvious to have modified the reference claim so that the walls of the nipple tunnel do not collapse onto the nipple.
4		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
5		Chang teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
6		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
7		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
8		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
9		Khalil teaches this limitation above. It would have been obvious to have modified the reference claim to enable easier positioning of the shield.
10		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
11		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers teaches this a known configuration.
12		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
13		Philips teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
14		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
15		Karsan teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
16		Silver teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
17		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
18		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
19		Blondheim teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.

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20		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
21		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
22		Myers and Khalil teach this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
24		Myers teaches this limitation above. It would have been obvious to have modified the reference claim as Myers and Khalil teaches this a known configuration.
25		Guthrie teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
29		Mendoza teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
30		Baker teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
31		Barack teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
32		Silver and Myers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
33		Meyers teaches this limitation above. It would have been obvious to have modified the reference claim for the same reason as provided above.
34		Cook teaches this limitation above. It would have been obvious to have modified the reference claim to ensure all shields fit with the breast pump.

### ***Allowable Subject Matter***

Except for the double patenting rejections above, **claim 28** would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not teach or suggest the pump delivers the claimed stall pressure and free air flow.

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### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to COURTNEY FREDRICKSON whose telephone number is (571)270-7481. The examiner can normally be reached Monday-Friday (9 AM - 5 PM EST).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NATHAN PRICE can be reached on 571-270-5421. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/COURTNEY B FREDRICKSON/  
Primary Examiner, Art Unit 3783

<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC - Searched*		
Symbol	Date	Examiner
a61m1/06-069	01/12/2022	cbf

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner


\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see SEARCH history	01/12/2022	cbf
searched inventors in PALM and SEARCH	01/12/2022	cbf
consulted child search history	01/12/2022	cbf
Updated search history	10/17/2022	cbf
Updated search	03/24/2023	cbf
Updated search	10/06/2023	cbf

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/COURTNEY B FREDRICKSON/ Examiner, Art Unit 3783	
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<b><i>Index of Claims</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

CLAIMS										
<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	01/12/2022	10/17/2022	03/24/2023	10/06/2023					
	1	✓	✓	✓	✓					
	2	✓	-	-	-					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
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	32	✓	✓	✓	✓					
	33	✓	✓	✓	✓					
	34		✓	✓	✓					

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

<b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	10/06/2023
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

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**SUPPLEMENTAL INFORMATION  
DISCLOSURE STATEMENT BY  
APPLICANT****Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet 3 of 3

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2023-05-15
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**



<b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	10/06/2023
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Sheet 3 of 3

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- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Richard D. Collier III/	Date (YYYY-MM-DD)	2023-04-20
Name/Print	Richard D. Collier III	Registration Number	60,390

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
Sheet	1	of	3	Attorney Docket Number	4944.0120006

## U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	US1	US20040024351A1	02-05-2004	GRETER; Andy et al.	
	US2	US20050228342A1	10-13-2005	YUEN; Yat Keung William	
	US3	US2015/0157775A1	06-11-2015	HU	
	US4	US20170173232A1	06-22-2017	CHANG; John Y. et al.	
	US5	US20180021491A1	01-25-2018	RIGERT; Mario et al.	
	US6	US20190209748A1	07-11-2019	ANALYTIS et al.	
	US7	US20210093761A1	04-01-2021	HWANG et al.	
	US8	US20230111110A1	04-13-2023	DE BECDELIEVRE et al.	
	US9	US20230143842A1	05-11-2023	O'TOOLE et al.	
	US10	US20230158215A1	05-25-2023	O'TOOLE et al.	
	US11	US4,673,388A	06-16-1987	SCHLENSOG et al.	
	US12	US9498565B2	11-22-2016	NOWROOZI et al.	
	US13	US11260151B2	03-01-2022	O'TOOLE; Jonathan et al.	
	US14	US11311654B2	04-26-2022	O'TOOLE; Jonathan et al.	
	US15	US11324866B2	05-10-2022	O'TOOLE; Jonathan et al.	
	US16	US11357894B2	06-14-2022	O'TOOLE; Jonathan et al.	
	US17	US11357893B2	06-14-2022	O'TOOLE; Jonathan et al.	
	US18	US11376352B2	07-05-2022	O'TOOLE; Jonathan et al.	
	US19	US11413380B2	08-16-2022	O'TOOLE; Jonathan et al.	

## FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./



<b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	February 22, 2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
	NPL1	Amended Complaint in Shenzhen Root Technology Co., Ltd. v. Chiaro Technology, Ltd., WDWA- 2-23-cv-00631, filed June 2, 2023; 24 pages.	

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	10/06/2023
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO

**SUPPLEMENTAL INFORMATION  
DISCLOSURE STATEMENT BY  
APPLICANT****Complete if Known**

Application Number	17/181,057
Filing Date	February 22, 2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet 3 of 3

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005 /	Date (YYYY-MM-DD)	2023-06-22
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	17/181057.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:05 PM
L2	128	((("O'TOOLE") near3 ("Jonathan")) OR ("ROLLO") near3 ("Adam")) OR ("CARR") near3 ("Andrew"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/12/31 01:05 PM
L3	8470	a61m1/06-069.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L5	2	("20170216505").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L6	8	("20130023821" "20070219486" "20160296682").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:14 PM
L7	2	("20140378895").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:16 PM
L8	2	("7824363").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU,	OR	ON	ON	2022/01/01 01:04 PM

L9	126	("10881766" OR "10926011" OR "20040087898" OR "20090281482" OR "20100292636" OR "20120165729" OR "20140263611" OR "20160228625" OR "20180110900" OR "20210196873" OR "20210196874" OR "20210196875" OR "20210196876" OR "20210205511" OR "20210205512" OR "20210205513" OR "20210205514" OR "20210205515" OR "20210205516" OR "20210205517" OR "20210205518" OR "20210228789" OR "20210268158" OR "7666162" OR "8608685" OR "20070135761" OR "20070179439" OR "20090281485" OR "20110009824" OR "20160271305" OR "20160296682" OR "20160325031" OR "20170095599" OR "20170112983" OR "20180028733" OR "20180333523" OR "5542921" OR "7833190" OR "10039871" OR "20020193731" OR "20040056641" OR "20040074281" OR "20040267215" OR "20050219302" OR "20060122575" OR "20070051172" OR "20070051727" OR "20080177224" OR "20080262420" OR "20080275386" OR "20110004154" OR "20110196291" OR "20110274566" OR "20120277636" OR "20130023821" OR	SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2022/01/12 05:14 PM
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		"20140031744" OR "20140052056" OR "20140275857" OR "20140323962" OR "20140378895" OR "20150217036" OR "20150217037" OR "20150283311" OR "20160000980" OR "20160058928" OR "20160058929" OR "20160082165" OR "20160082166" OR "20160151551" OR "20160158424" OR "20160166745" OR "20160206794" OR "20160220743" OR "20160220745" OR "20160256617" OR "20160287767" OR "20160296681" OR "20160310650" OR "20170021068" OR "20170035951" OR "20170043065" OR "20170072117" OR "20170072118" OR "20170143879" OR "20170220753" OR "20180021490" OR "20180110906" OR "2849881" OR "4390024" OR "4535627" OR "5474683" OR "5941847" OR "5973770" OR "6045529" OR "6090065" OR "6227936" OR "6328709" OR "6358226" OR "6383163" OR "6440100" OR "6461324" OR "6547756" OR "6579258" OR "6663587" OR "6749582" OR "7048519" OR "7201735" OR "7312554" OR "7314400" OR "7662018" OR "7776008" OR "8057425" OR "8118772" OR					
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L10	45	"8187227" OR "8262606" OR "8282596" OR "8376986" OR "8702646" OR "8801495" OR "8876760" OR "8926556" OR "9033913" OR "9173587" OR "9345274" OR "9539377" OR "D548831").pn. 9 AND (transparent)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/12 06:05 PM
L11	105	3 AND (batter\$4) AND ((interface flange shield cup) WITH (clear transparent))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/13 02:07 PM
L12	382	3 AND (silicone WITH plastic)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 10:40 AM
L13	2	("20180333523").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 11:50 AM
L14	43	3 AND ((USB "universal service bus") WITH (charg\$4 recharg\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:19 PM
L15	2	("20160220743").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD,	OR	ON	ON	2022/01/14 12:42 PM

L16	5	("5542921").pn.	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:52 PM
L20	256	3 AND ((shield cup interface flange) WITH (siz\$4) WITH different)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:23 PM
L21	2	("20120165729").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:31 PM
L22	2	("10881766").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:23 PM
L23	2	("10926011").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:38 PM
L24	12	("20080275386" "20140378895" "20130023821" "20180333523" "20160296682" "20070228059" "20120277636" "20160220743" "6227936" "20090281485" "20120165729"	(US-PGPUB; USPAT)	OR	ON	ON	2022/01/14 03:55 PM

L25	267	"5542921").pn. 3 AND (nipple WITH (chang\$4 differ\$4 adjust\$4 dissimilar\$4) WITH (size width))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/17 03:06 PM
L26	2	"44148977".fmid.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; JPO)	OR	ON	ON	2022/10/17 03:31 PM
L27	1	("10926011").pn.	(USPAT)	OR	ON	ON	2022/10/19 04:47 PM
L28	11	("0000002" OR "10864306" OR "20050245860" OR "20070236584" OR "20080299517" OR "20120109083" OR "20140142501" OR "20160135998" OR "20180008758" OR "20180104396" OR "5406063").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/24 04:55 PM
L29	91	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (indicator line guid\$4 symbol indicia))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:26 PM
L30	17	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (mark\$4 label))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:31 PM
L31	2	("20020198489").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/03/24 05:34 PM



L32	19	(breast WITH shield) AND (size WITH label\$4)	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:55 PM
L33	1	(09/888322).APP.	(USPAT; USOCR)	OR	ON	ON	2023/03/24 05:56 PM
L34	1	1 AND (correct WITH nipple WITH align\$6)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/06 02:29 PM

**PE2E SEARCH - Search History (Interference)**

There are no Interference searches to show.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDERICKSON, Courtney B
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s)  <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input checked="" type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input type="checkbox"/> Other Enclosure(s) (please identify below):
<div>Remarks</div> <p>The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.</p> <p>Online Credit Card Payment Authorization in the Amount of \$104.00 to Cover: \$104.00 - Information Disclosure Statement fee</p>		
<b>SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT</b>		
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.	
Signature	/Yangbeini Wang #800,005/	
Printed name	Yangbeini Wang	
Date	December 1, 2023	Reg. No. 800,005

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**12/01/2023 03:27:11 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

## Title of Invention

BREAST PUMP SYSTEM

## Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 63458258

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

## Documents

**TOTAL DOCUMENTS: 3**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2023-12-01-Transmittal-Form-slDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	161 KB
2023-12-01-slDS-Pleading-4944-0120006.pdf	3	Transmittal Letter	98 KB
2023-12-01-slDS-Form-SB08-4944-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	146 KB

Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.

## Digest

## DOCUMENT

## MESSAGE DIGEST(SHA-512)

2023-12-01-Transmittal-Form-  
slDS-4944-0120006.pdf

42A213C30FDFC9CBAFB29ED3858F85EC0E4F8E03DB5F0B3B  
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2023-12-01-slDS-Pleading-  
4944-0120006.pdf

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2023-12-01-slDS-Form-SB08-  
4944-0120006.pdf

1023928D0A85853F6ABAFCC5D3BED061D344D45646182E7BA  
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13C4D5A8D95D1385819AB3859814AF

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop AF*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(c) and is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an

- 2 -

Jonathan O'TOOLE  
Application No.: 17/181,057

action that otherwise closes prosecution in the application. The required fee is provided through online credit card payment authorization in the amount of **\$104.00** in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of the Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

Atty. Dkt. No. 4944.0120006

- 3 -

Jonathan O'TOOLE  
Application No.: 17/181,057

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: December 1, 2023

1101 K Street, NW  
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Direct: 202-772-8833

21279079.1

Atty. Dkt. No. 4944.0120006





Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>

Examiner Signature		Date Considered	
-----------------------	--	--------------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	3	of	3		

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☒ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☐ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005 /	Date (YYYY-MM-DD)	2023-12-01
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov**ELECTRONIC PAYMENT RECEIPT**APPLICATION #  
17/181,057RECEIPT DATE / TIME  
12/01/2023 03:27:11 PM Z ETATTORNEY DOCKET #  
4944.0120006**Title of Invention**

BREAST PUMP SYSTEM

**Application Information**APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitton

PATENT CENTER # 63458258

AUTHORIZED BY Yangbeini Wang

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE ADDRESS -

FIRST NAMED INVENTOR Jonathan O'TOOLE

**Payment Information**PAYMENT METHOD  
CARD / 1008PAYMENT TRANSACTION ID  
E2023B1F28228758PAYMENT AUTHORIZED BY  
Jon Baitton

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
2806	SUBMISSION OF AN INFORMATION DISCLOSURE STATEMENT	104.00	1	104.00
TOTAL AMOUNT:				\$104.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**02/12/2024 03:25:37 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Rolonda Lee

PATENT CENTER # 64286342

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED  
INVENTOR Jonathan O'TOOLECORRESPONDENCE  
ADDRESS -

AUTHORIZED BY Yangbeini Wang

### Documents

**TOTAL DOCUMENTS: 6**

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2024-02-12-Request-AFCP-4944-0120006.pdf		2	After Final Consideration Program Request	203 KB
2024-02-12-Amendment-Reply-116-4944-0120006.pdf		12	-	251 KB
2024-02-12-Amendment-Reply-116-4944-0120006-A.NE.pdf	(1-1)	1	Response After Final Action	103 KB
2024-02-12-Amendment-Reply-116-4944-0120006-CLM.pdf	(2-6)	5	Claims	81 KB
2024-02-12-Amendment-Reply-116-4944-0120006-REM.pdf	(7-12)	6	Applicant Arguments/Remarks Made in an Amendment	238 KB

2024-02-12-Transmittal-Form-4944-0120006.pdf	1	Transmittal Letter	165 KB
2024-02-12-EOT-4944-0120006.pdf	1	Extension of Time	222 KB

## Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024-02-12-Request-AFCP-4944-0120006.pdf	D77CA6632710E4D6C4BAF96E4B201FAC9201A7D1BE55901722C548EEF7A44E5172F2D0FE4119268BC23B63E881F232D6ADBF4A699B2ABC562256C0B4F78166AA
2024-02-12-Amendment-Reply-116-4944-0120006.pdf	B09A28F30EB9A77EFA69CF59FB44EDD922F5AFF0CBEDE407A70E079F30AEE862A51619DF0FB80CB44E30AB75569714838161B69A1EFABEF15894948F9A27C617
2024-02-12-Amendment-Reply-116-4944-0120006-A.NE.pdf	070F37E929CC4DFF45941210EA75A73FADAFE7276D8B04405F79C0C39C891179FCB9D1407AB2F7FC60847E6E71D175A37C79481584968145220C4092118DCA04
2024-02-12-Amendment-Reply-116-4944-0120006-CLM.pdf	B943BE66F8AF7575B65011C291E486878F2BA405D8A95E22DC634B2A29DFE9AD158D35758F0BF3EEA81A562F7C5A8262BE64D8614699EF718F15FD0B298F9BD0
2024-02-12-Amendment-Reply-116-4944-0120006-REM.pdf	665A9D00775416E60C833D1A33427B539C8254CAF5D10CB09A1584CF671BD05C3F786EB319DEFD4C9ECB3467B231587ECD2EDAF4E3DCC4FF54899D5DEF9D48A5
2024-02-12-Transmittal-Form-4944-0120006.pdf	04D1C32F382AFC6E1027203CD46D140DE1330FE8BC00286F57CD649A04C778E8955050E34A41586A708A4702B91CF9A60E582D2CE35C66073C2836955659D064
2024-02-12-EOT-4944-0120006.pdf	29E841F0CC6976E66FDD602A587CDC7827CDA5FB3E3C357D81FB68E3E9BC561EB1D24911DC40F63F15F39A9E37313A4968EE4924C54B24C7E2D159BF5B7A30CC

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b>		Docket Number (Optional)  <b>4944.0120006</b>
Application Number <b>17/181,057</b>	Filed <b>02/22/2021</b>	
For <b>BREAST PUMP SYSTEM</b>		
Art Unit <b>3783</b>	Examiner <b>FREDRICKSON, Courtney B.</b>	

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
<input checked="" type="checkbox"/> One month (37 CFR 1.17(a)(1))	\$220	\$88	\$44	\$ <b>220</b>
<input type="checkbox"/> Two months (37 CFR 1.17(a)(2))	\$640	\$256	\$128	\$ _____
<input type="checkbox"/> Three months (37 CFR 1.17(a)(3))	\$1,480	\$592	\$296	\$ _____
<input type="checkbox"/> Four months (37 CFR 1.17(a)(4))	\$2,320	\$928	\$464	\$ _____
<input type="checkbox"/> Five months (37 CFR 1.17(a)(5))	\$3,160	\$1,264	\$632	\$ _____

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.  
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to  
Deposit Account Number **19-0036**.

☒ Payment made via USPTO's patent electronic filing system (Patent Center or EFS-Web).

**WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number **800,005**

☐ attorney or agent acting under 37 CFR 1.34. Registration number \_\_\_\_\_

**/Yangbeini Wang #800,005/** **February 8, 2024**

Signature Date

**Yangbeini Wang** **(202) 371-2600**

Typed or printed name Telephone Number

**NOTE:** This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below\*.

☐ \* Total of \_\_\_\_\_ forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 6 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email [InformationCollection@uspto.gov](mailto:InformationCollection@uspto.gov). **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDRICKSON, Courtney B.
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance Communication to TC
<input checked="" type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input checked="" type="checkbox"/> Amendment/Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input checked="" type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation	<input type="checkbox"/> Status Letter
<input checked="" type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Change of Correspondence Address	<input checked="" type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	Certification and Request for Consideration Under the After Final Consideration Pilot Program 2.0
<input type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> Request for Refund	
<input type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Reply to Missing Parts/Incomplete Application	<input type="checkbox"/> Landscape Table on CD	
<input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	Remarks	

Online Credit Card Authorization for \$220.00 to cover the 1 Month Extension of Time Fee.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any over payment, to our Deposit Account No. 19-0036.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	February 8, 2024	Reg. No.	800,005

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC PAYMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**02/12/2024 03:25:37 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Rolonda Lee

PATENT CENTER # 64286342

AUTHORIZED BY Yangbeini Wang

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE  
ADDRESS -FIRST NAMED  
INVENTOR Jonathan O'TOOLE

### Payment Information

PAYMENT METHOD  
CARD / 1005PAYMENT TRANSACTION ID  
E20242BF27016926PAYMENT AUTHORIZED BY  
Rolonda Lee

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1251	EXTENSION FOR RESPONSE WITHIN FIRST MONTH	220.00	1	220.00
TOTAL AMOUNT:				\$220.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

#### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

#### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage

submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**Amendment Under 37 C.F.R. § 1.116  
Expedited Procedure – Art Unit 3783**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'Toole

Applicant: Chiaro Technology Limited

Application No.: 17/181,057

Filing Date or 371(c) Date: February 22, 2021

Title: **BREAST PUMP SYSTEM**

Confirmation No.: 4690

Art Unit: 3783

Examiner: FREDRICKSON, Courtney B.

Atty. Docket: 4944.0120006

**Amendment and Reply Under 37 C.F.R. § 1.116**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

*Mail Stop AF*

Commissioner:

In reply to the Office Action dated **October 12, 2023**, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

- 2 -

Chiaro Technology Limited  
Application No. 17/181,057

*Amendments to the Claims*

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A breast pump device comprising:
  - a housing comprising:
    - a battery, and
    - a pump configured to generate negative air pressure;
  - a breast shield of a plurality of interchangeable breast shields, each of the plurality of interchangeable breast shields having a different size and being configured to slide in and out of the housing, the breast shield comprising a breast flange and a nipple tunnel comprising a side wall and a front end, and ~~fit lines~~ guide lines, wherein the breast shield is transparent or optically clear; and
  - a milk container configured to be attached to and removed from the housing,wherein the plurality of interchangeable breast shields are each configured to provide a different spacing of a nipple from the side wall of the nipple tunnel when each of the plurality of interchangeable breast shields is placed onto a breast, and
  - wherein the ~~fit lines~~ guide lines are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved and to visually define a correct spacing of the nipple from the side wall of the nipple tunnel.
2. (Canceled)
3. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is rigid.
4. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is a dishwasher safe, plastic breast shield.

5. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to be attached using magnets to the housing.
6. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to rotate smoothly around a nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto a breast.
7. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to present, in use, a single continuous surface to a nipple and a breast.
8. (Previously Presented) The breast pump device of claim 1, wherein the breast flange and the nipple tunnel are integrally formed.
9. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to be generally symmetrical about a center-line running from a top to a bottom of the breast shield when positioned upright for normal use.
10. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to slide into the housing with a single push action.
11. (Previously Presented) The breast pump device of claim 1, wherein the breast shield is configured to slide out from the housing, together with a membrane that is configured to prevent milk from flowing into the pump.
12. (Previously Presented) The breast pump device of claim 1, wherein the milk container is rigid.

- 4 -

Chiaro Technology Limited  
Application No. 17/181,057

13. (Previously Presented) The breast pump device of claim 1, wherein the milk container is an optically clear, dishwasher safe, plastic milk container.
14. (Previously Presented) The breast pump device of claim 1, wherein the milk container is configured to attach to a lower part of the housing and forms a base of the breast pump device.
15. (Previously Presented) The breast pump device of claim 1, wherein the milk container is configured to magnetically attach to the housing.
16. (Currently Amended) The breast pump device of claim 1, wherein the ~~fit lines~~ guide lines are configured to run parallel along one or more sides of the nipple tunnel.
17. (Previously Presented) The breast pump device of claim 1, wherein the nipple tunnel comprises an air hole or passage, and wherein the pump is configured to transfer negative air pressure into the nipple tunnel via the air hole or passage.
18. (Previously Presented) The breast pump device of claim 1, wherein the nipple tunnel comprises on a lower surface of the nipple tunnel an opening through which expressed milk flows into the milk container.
19. (Previously Presented) The breast pump device of claim 1, wherein the pump comprises one or more piezo air pumps.
20. (Previously Presented) The breast pump device of claim 1, wherein the housing further comprises a Universal Serial Bus (USB) charging socket.

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21. (Previously Presented) The breast pump device of claim 1, wherein the housing comprises a left or right breast selector or toggle switch that, when selected for a particular pumping session, is configured to send data to a connected application configured to track pumping sessions, to indicate whether that particular session is associated with a left or a right breast.
22. (Previously Presented) The breast pump device of claim 1, wherein the housing is configured to be shaped to fit inside a bra by having an outer surface that is curved to fit contours of a bra.
23. (Canceled)
24. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device is configured to deliver a maximum suction of approximately 240 mmHg.
25. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device comprises a sensor that is configured to directly measure a level of milk in the milk container by measuring an intensity of light reflected from a surface of the milk stored in the milk container.
26. (Canceled)
27. (Canceled)
28. (Previously Presented) The breast pump device of claim 1, wherein the pump is configured to deliver in excess of 400 mBar (40 kPa) stall pressure and 1.5 litres per minute free air flow.



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29. (Previously Presented) The breast pump device of claim 1, wherein the pump is a lightweight air pump that enables a total mass of the breast pump device, unfilled with milk, to be less than 250 gm.
30. (Previously Presented) The breast pump device of claim 1, wherein the breast pump device is configured to make less than 30 dB noise at maximum power and less than 25 dB at normal power, against a 20 dB ambient noise.
31. (Previously Presented) A kit, comprising:
  - the breast pump device of claim 1; and
  - the plurality of interchangeable breast shields.
32. (Currently Amended) The kit of claim 31, wherein ~~the fit lines~~ guide lines are configured to enable a user to visually inspect whether that breast shield is sized for a nipple of the user when the nipple is placed in the nipple tunnel.
33. (Previously Presented) The breast pump device of claim 1, wherein the battery is a rechargeable battery, and wherein the housing further comprises:
  - a power charging circuit configured to control the charging of the rechargeable battery, and
  - control electronics configured to be powered by the rechargeable battery.
34. (Previously Presented) The breast pump device of claim 1, wherein a length from the breast flange to the front end of each of the nipple tunnels of the plurality of interchangeable breast shields is the same.

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### ***Remarks***

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1, 3–22, 24, 25, and 28–34 are pending in the application. Claim 1 is an independent claim. Claims 1, 16, and 32 are amended. These changes introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Office reconsider all outstanding rejections and that they be withdrawn.

### ***Allowable Subject Matter***

Applicant thanks the Examiner for indicating that claim 28 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Office Action 37. Upon entry of above amendment and based on the following remarks, Applicant respectfully submits that all pending claims are in condition for allowance.

### ***Rejections under 35 U.S.C. § 103***

#### **Independent claim 1**

Claims 1, 3, 6–8, 10, 11, 14, 16–18, 22, 24, 31, 32, and 34 are rejected under 35 U.S.C. § 103 as unpatentable over U.S. Applicant No. 2008/0275386 to Myers, in view of EP 2502640 to Cook et al., and in further view of U.S. Patent Applicant Publication No. 2002/0198489 to Silver et al.

Claims 1, 6–10, 14, 17, 18, 20, 22, 31, 32, and 34 are rejected under 35 U.S.C. § 103 as unpatentable over U.S. Patent Applicant Publication No. 2013/0023821 to Khalil et al. in view of Myers, in view of Cook, and further in view of Silver.

Without agreeing to the propriety of the rejections, claim 1 is amended and now recites, “wherein the guide lines are configured to be aligned with the outside of the nipple when a correct

nipple alignment is achieved and to visually define a correct spacing of the nipple from the side wall of the nipple tunnel.” The applied references do not teach or suggest at least this feature of claim 1.

The Office acknowledges that Myers, Cook, and Khalil do not teach that the nipple tunnel comprises a guide line configured to define the spacing of the nipple from the side wall of the nipple tunnel, and only relies on Sliver for this feature. Office Action, 6–8 and 11–13.

Silver discloses a breastshield 1095 formed with a skeletal frame, and the skeletal frame comprises a series of stiffening longitudinally extending ribs 1160, 1164, and 1166, which allegedly correspond to the recited guide lines. Silver, FIG. 28; Office Action, 8. However, Silver is silent on how ribs 1160, 1164, and 1166 can define a correct spacing of the nipple from the side of the nipple tunnel.

The Office in response contends that the ribs of Silver is configured to define a corrected space of the nipple from the side of the nipple tunnel because if a user *feels* the ribs against the breast/nipple, it signals that the breast shield is improperly sized. Office Action, 3. The ribs of Silver, however, does not *visually* define a correct spacing of the nipple from the side wall of the nipple tunnel, as recited in amended claim 1.

In addition, claim 1 recites, “a breast shield of a plurality of interchangeable breast shields, each of the plurality of interchangeable breast shields having a different size.” The person of skill in the art would have understood that on breast shields of different sizes, the guide lines that visually define a correct spacing of the nipple from the side wall of the nipple tunnel would be positioned differently, as shown in FIG. 14 of the present application (reproduced below). In contrast, the ribs of Silver, as the skeletal frame for structural support, would not be positioned differently on differently sized breast shields. Indeed, Silver does not disclose a plurality of interchangeable breast shields having different sizes, so Silver does not provide the motivation to position the ribs on different locations as a visual signal reflecting differently sized breast shields.

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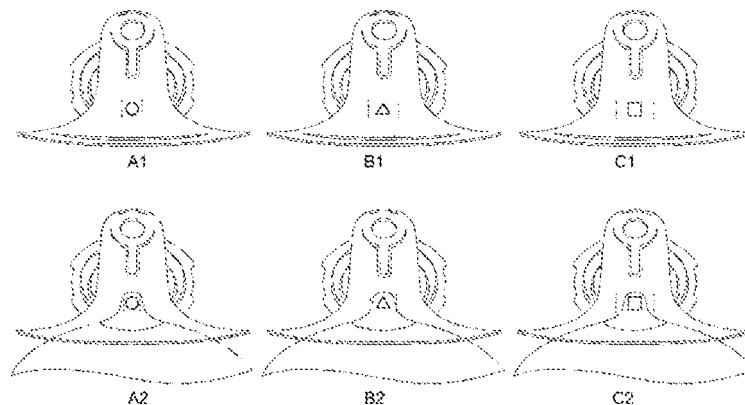
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FIGURE 14

FIG. 14 of Present Application

Accordingly, amended claim 1 and its dependent claims would not have been obvious over the applied references. Applicant respectfully requests reconsideration and withdrawal of the § 103 rejections of claims 1, 3, 6–10, 11, 14, 16–18, 20, 22, 24, 31, 32, and 34.

#### Dependent claims

Claim 4 is rejected under 35 U.S.C. § 103 as unpatentable over Myers in view of Cook in view of Silver and further in view of U.S. Patent Application Publication No. 2005/0228342 to Yuen.

Claim 5 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2018/0333523 to Chang et al.

Claims 12 and 13 are rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2016/0296682 to Phillips et al.

Claim 15 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver as applied and in further view of U.S. Patent Applicant Publication No. 2007/0228059 to Karsan.

Claim 19 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2012/0277636 to Blondheim et al.

Claims 20 and 21 are rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2014/0378895 to Barak.

Claim 25 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2016/0220743 to Guthrie et al.

Claim 29 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent No. 6,227,936 to Mendoza.

Claim 30 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver and further in view of U.S. Patent Applicant Publication No. 2009/0281485 to Baker et al.

Claim 33 is rejected under 35 U.S.C. § 103 as unpatentable over Khalil in view of Myers in view of Cook in view of Silver as applied and further in view of U.S. Patent No. 5,542,921 to Meyers (“Meyers ‘921”).

Each of claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33 depends from and adds features to independent claim 1. The additionally applied references do not overcome the deficiencies of Myers, Cook, Silver, and Khalil as discussed above. Accordingly, claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33 would not have been obvious over the applied references. Applicant respectfully requests reconsideration and withdrawal of the § 103 rejections of claims 4, 5, 12, 13, 15, 19–21, 25, 29, 30, and 33.

### ***Double Patenting Rejection***

Claims 1, 3–22, 24, 25, and 29–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers, Cook, and Silver.

- U.S. Applicant No. 17/203050 (U.S. Patent No. 11357893)
- U.S. Applicant No. 17/203079 (U.S. Patent No. 11376352)
- U.S. Applicant No. 17/203216 (U.S. Patent No. 11357894)
- U.S. Applicant No. 17/203259 (U.S. Patent No. 11324866)
- U.S. Applicant No. 17/203327 (U.S. Patent No. 11413380)

Claims 1, 3–22, 24, 25, and 28–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers and Cook, and Silver.

- U.S. Applicant No. 17/203109 (U.S. Patent No. 11260151)
- U.S. Applicant No. 17/203313 (U.S. Patent No. 11311654)

Claims 1, 3–22, 24, 25, and 29–34 are rejected on the grounds of non-statutory obviousness type double patenting based on the following patents and applications in view of Myers, Cook, and Silver. Office Action, 34–38.

- U.S. Applicant No. 17/203150
- U.S. Applicant No. 17/203179
- U.S. Applicant No. 17/203292
- U.S. Applicant No. 17/203355
- U.S. Applicant No. 17/203384
- U.S. Applicant No. 17/203397
- U.S. Applicant No. 17/203418

Applicant respectfully requests that the currently asserted double patenting rejections be held in abeyance until the claimed subject matter is otherwise deemed allowable. After analyzing the final allowed claim scope, Applicant will consider filing a terminal disclaimer if necessary to overcome any obviousness-type double patenting rejections.

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***Conclusion***

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Office reconsider all presently outstanding rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Office believes, for any reason, that personal communication will expedite prosecution of this application, the Office is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: February 8, 2024

1101 K Street NW, 10<sup>th</sup> Floor  
Washington, D.C. 20005  
Main: (202) 371-2600

Doc Code: A.NE.AFCP

Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

<b>CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0</b>		
<b>Practitioner Docket No.:</b> <b>4944.0120006</b>	<b>Application No.:</b> <b>17/181,057</b>	<b>Filing Date:</b> <b>02/22/2021</b>
<b>First Named Inventor:</b> <b>Jonathan O'TOOLE</b>	<b>Title:</b> <b>BREAST PUMP SYSTEM</b>	
<p>APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.</p> <ol style="list-style-type: none"> <li>1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (e.g., a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).</li> <li>2. The above-identified application contains an outstanding final rejection.</li> <li>3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.</li> <li>4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.</li> <li>5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.</li> <li>6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).</li> <li>7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]</li> <li>8. By filing this certification and request, applicant acknowledges the following:               <ul style="list-style-type: none"> <li>• Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.</li> <li>• The examiner will verify that the AFCP 2.0 submission is compliant, i.e., that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:                   <ul style="list-style-type: none"> <li>○ The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, e.g., by mailing an advisory action.</li> <li>○ If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.                       <ul style="list-style-type: none"> <li>• The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.</li> <li>• If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.</li> </ul> </li> </ul> </li> </ul> </li> </ol>		
<b>Signature</b> <b>/Yangbeini Wang #800,005/</b>	<b>Date</b> <b>February 8, 2024</b>	
<b>Name</b> <b>(Print/Typed) Yangbeini Wang</b>	<b>Practitioner</b> <b>Registration No. 800,005</b>	
<p><i>Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</i></p>		
<p><input type="checkbox"/> * Total of _____ forms are submitted.</p>		



## Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875				Application or Docket Number 17/181,057		Filing Date 02/22/2021		<input type="checkbox"/> To be Mailed	
ENTITY: <input type="checkbox"/> LARGE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> MICRO									
<b>APPLICATION AS FILED - PART I</b>									
		(Column 1)			(Column 2)				
FOR		NUMBER FILED	NUMBER EXTRA			RATE (\$)	FEE (\$)		
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A			N/A			
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A			N/A			
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A			N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$50 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$240 =			
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
<b>APPLICATION AS AMENDED - PART II</b>									
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT	02/12/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0		x \$40 =	0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x \$192 =	0	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))								
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
							TOTAL ADD'L FEE	0	
		(Column 1)			(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=		x \$0 =		
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x \$0 =		
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))								
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
							TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						PROGRAM SUPPORT SPECIALIST			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/FIKIRTE A GEREMEW/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

**Amendment Under 37 C.F.R. § 1.116  
Expedited Procedure – Art Unit 3783**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'Toole

Applicant: Chiaro Technology Limited

Application No.: 17/181,057

Filing Date or 371(c) Date: February 22, 2021

Title: **BREAST PUMP SYSTEM**

Confirmation No.: 4690

Art Unit: 3783

Examiner: FREDRICKSON, Courtney B.

Atty. Docket: 4944.0120006

**Amendment and Reply Under 37 C.F.R. § 1.116**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

*Mail Stop AF*

Commissioner:

In reply to the Office Action dated **October 12, 2023**, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.



UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
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Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690
26111	7590	02/22/2024	EXAMINER	
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.			FREDRICKSON, COURTNEY B	
1101 K Street, NW			ART UNIT	
10th Floor			PAPER NUMBER	
WASHINGTON, DC 20005			3783	
			NOTIFICATION DATE	
			DELIVERY MODE	
			02/22/2024	
			ELECTRONIC	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

e-office@sternekessler.com

<b>Advisory Action</b> <b>Before the Filing of an Appeal Brief</b>		Application No. 17/181,057		Applicant(s) O'TOOLE et al.	
		Examiner COURTNEY FREDRICKSON		Art Unit 3783	
				AIA (FITF) Status Yes	

**--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

THE REPLY FILED 12 February 2024 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

**NO NOTICE OF APPEAL FILED**

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires \_\_\_\_\_ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

*Examiner Note:* If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**NOTICE OF APPEAL**

2. ☐ The Notice of Appeal was filed on \_\_\_\_\_. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

**AMENDMENTS**

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: See Continuation Sheet (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): \_\_\_\_\_

6. ☐ Newly proposed or amended claim(s) \_\_\_\_\_ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

**AFFIDAVIT OR OTHER EVIDENCE**

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

**REQUEST FOR RECONSIDERATION/OTHER**

12. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:  
Further search and consideration of the proposed amendments is required..

13. ☒ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). \_\_\_\_\_

14. ☒ Other: PTO-2323.

**STATUS OF CLAIMS**

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: \_\_\_\_\_.

Claim(s) objected to: \_\_\_\_\_.

Claim(s) rejected: 1,3-22,24-25 and 28-34.

Claim(s) withdrawn from consideration: \_\_\_\_\_.

/COURTNEY B FREDRICKSON/  
Primary Examiner, Art Unit 3783

Continuation Sheet (PTOL-303)

Continuation of 3. NOTE: The amendment presents limitations which were not previously considered and which change the scope of the claim. Further time in excess of that allowed under the AFCP pilot is required to determine if the amendments would place the application in condition for allowance.

## AFCP 2.0 Decision

**Application No.**

17/181,057

**Applicant(s)**

O'TOOLE et al.

**Examiner**

COURTNEY FREDRICKSON

**Art Unit**

3783

**AIA (FITF) Status**

Yes

This is in response to the After Final Consideration Pilot request filed 12 February 2024.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

- ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.
- ☐ A non-broadening amendment to at least one independent claim was not submitted.
- ☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.
- ☐ Other: \_\_\_\_\_

2. **Proper Request**

- A. After final amendment submitted with the request will not be treated under AFCP 2.0.

The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

- ☒ The after final amendment will be treated under pre-pilot procedure.

- B. Updated search and/or completed additional consideration.

The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

- ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.
- ☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action. See attached interview summary for further details.
- ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.
- ☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.
- ☐ 5. Other: \_\_\_\_\_

Examiner Note: Please attach an interview summary when necessary as described above.

**Amendment Under 37 C.F.R. § 1.116  
Expedited Procedure – Art Unit 3783**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'Toole

Confirmation No.: 4690

Applicant: Chiaro Technology Limited

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, Courtney B.

Filing Date or 371(c) Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Amendment and Reply Under 37 C.F.R. § 1.116**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

***Mail Stop AF***

Commissioner:

In reply to the Office Action dated **October 12, 2023**, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

<div>Substitute for form 1449/PTO</div> <div>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</div>				Complete if Known	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	2	of	3		

NON-PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published		T <sup>2</sup>

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	02/13/2024
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO

**SUPPLEMENTAL INFORMATION  
DISCLOSURE STATEMENT BY  
APPLICANT****Complete if Known**

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet 3 of 3

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☒ See attached certification statement.
- ☒ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☐ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005 /	Date (YYYY-MM-DD)	2023-12-01
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**Request  
for  
Continued Examination (RCE)  
Transmittal**Address to:  
Mail Stop RCE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDRICKSON, Courtney B.
Attorney Docket Number	4944.0120006

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.**

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).
- a. ☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.
- i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on \_\_\_\_\_
- ii. ☒ Other Amendment and Reply Under 37 C.F.R. § 1.116 filed on February 12, 2024.
- b. ☐ Enclosed
- i. ☐ Amendment/Reply
- ii. ☐ Affidavit(s)/ Declaration(s)
- iii. ☐ Information Disclosure Statement (IDS)
- iv. ☐ Other \_\_\_\_\_
2. **Miscellaneous**
- a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of \_\_\_\_\_ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)
- b. ☐ Other \_\_\_\_\_
3. **Fees** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
- a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 19-0036.
- i. ☒ RCE fee required under 37 CFR 1.17(e)
- ii. ☒ Extension of time fee (37 CFR 1.136 and 1.17)
- iii. ☐ Other \_\_\_\_\_
- b. ☐ Check in the amount of \$ \_\_\_\_\_ enclosed
- c. ☐ Payment by credit card (Form PTO-2038 enclosed)
- d. ☒ Payment by EFS-Web

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.****SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED**

Signature	/Yangbeini Wang #800,005/	Date	March 6, 2024
Name (Print/Type)	Yangbeini Wang	Registration No.	800,005

**CERTIFICATE OF MAILING OR TRANSMISSION**

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office (USPTO), deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the USPTO on the date shown below.

Signature			
Name (Print/Type)		Date	

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 12 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email [InformationCollection@uspto.gov](mailto:InformationCollection@uspto.gov). DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to:

Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	17/181,057
	Filing Date	02/22/2021
	First Named Inventor	Jonathan O'TOOLE
	Art Unit	3783
	Examiner Name	FREDRICKSON, Courtney B.
Total Number of Pages in This Submission	Attorney Docket Number	4944.0120006

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached  <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input checked="" type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers  <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC  <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences  <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Request for Continued Examination Transmittal (PTO/SB/30EFS)
<b>Remarks</b> Online Credit Card Authorization for \$2,420.00 to cover:  \$420.00 - 2nd Month Extension of Time Fee; \$2,000.00 to cover the RCE Fee.  The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any over payment, to our Deposit Account No. 19-0036.		
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT		
Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.	
Signature	/Yangbeini Wang #800,005/	
Printed name	Yangbeini Wang	
Date	March 6, 2024	Reg. No. 800,005

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**03/07/2024 06:43:16 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Kim Perry

PATENT CENTER # 64597343

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED  
INVENTOR Jonathan O'TOOLECORRESPONDENCE  
ADDRESS -

AUTHORIZED BY Yangbeini Wang

### Documents

**TOTAL DOCUMENTS: 3**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024-03-07-EOT-4944-0120006.pdf	1	Extension of Time	238 KB
2024-03-07-Transmittal-Form-4944-0120006.pdf	1	Transmittal Letter	201 KB
2024-03-07-RCE-4944-0120006.pdf	1	Request for Continued Examination (RCE)	265 KB

Warning: This is not a USPTO supplied RCE fillable form. Data in the form cannot be automatically loaded to other USPTO systems.

### Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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2024-03-07-EOT-4944-  
0120006.pdf

6E0D3E9467891B0D673F8340A43625DA0FF54B3566AD15D5C  
D2D40AF73F53D7E774A95225B555D5A3E11C6C196AF2132BC  
A043740CCB42A80F31B18E98B13F69

2024-03-07-Transmittal-Form-  
4944-0120006.pdf

71FA5FE161B3FA7044FF914B88ABB74D7FE5E6E40C7F8F0BE  
CE5F63FFDB477860BD9929E336A78A8C4101DDF1B032BC51  
F9F2FA6021B075CB68CE037631CE1FA

2024-03-07-RCE-4944-  
0120006.pdf

13EECAACB12EEF6F4DDF0E0230CE9C2BDC78670096174BC  
523B050AC50B6ACBCA158FB9E8825386E5A6D7C9F7B18BE3  
6B76D3A6D9099EDFA00767D418473CAC3

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

#### **New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

#### **National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

#### **New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b>		Docket Number (Optional) <b>4944.0120006</b>
Application Number <b>17/181,057</b>	Filed <b>02/22/2021</b>	
For <b>BREAST PUMP SYSTEM</b>		
Art Unit <b>3783</b>	Examiner <b>FREDRICKSON, Courtney B.</b>	

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>	
<input type="checkbox"/> One month (37 CFR 1.17(a)(1))	\$220	\$88	\$44	\$ _____
<input checked="" type="checkbox"/> Two months (37 CFR 1.17(a)(2))	\$640	\$256	\$128	\$ <u>420</u>
<input type="checkbox"/> Three months (37 CFR 1.17(a)(3))	\$1,480	\$592	\$296	\$ _____
<input type="checkbox"/> Four months (37 CFR 1.17(a)(4))	\$2,320	\$928	\$464	\$ _____
<input type="checkbox"/> Five months (37 CFR 1.17(a)(5))	\$3,160	\$1,264	\$632	\$ _____

☐ Applicant asserts small entity status. See 37 CFR 1.27.☐ Applicant certifies micro entity status. See 37 CFR 1.29.  
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.☐ A check in the amount of the fee is enclosed.☐ Payment by credit card. Form PTO-2038 is attached.☐ The Director has already been authorized to charge fees in this application to a Deposit Account.☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to  
Deposit Account Number 19-0036.☒ Payment made via USPTO's patent electronic filing system (Patent Center or EFS-Web).**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

I am the

☐ applicant.☒ attorney or agent of record. Registration number 800,005.☐ attorney or agent acting under 37 CFR 1.34. Registration number \_\_\_\_\_./Yangbeini Wang #800,005/

Signature

Yangbeini Wang

Typed or printed name

March 6, 2024

Date

(202) 371-2600

Telephone Number

**NOTE:** This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below\*.☐ \* Total of \_\_\_\_\_ forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 6 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email [InformationCollection@uspto.gov](mailto:InformationCollection@uspto.gov). **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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## ELECTRONIC PAYMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**03/07/2024 06:43:16 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Kim Perry

PATENT CENTER # 64597343

AUTHORIZED BY Yangbeini Wang

CUSTOMER # 26111

FILING DATE 02/22/2021

CORRESPONDENCE  
ADDRESS -FIRST NAMED  
INVENTOR Jonathan O'TOOLE

### Payment Information

PAYMENT METHOD  
CARD / 3007PAYMENT TRANSACTION ID  
E202437I46249254PAYMENT AUTHORIZED BY  
Kim Perry

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1252	EXTENSION FOR RESPONSE WITHIN SECOND MONTH	420.00	1	420.00
1820	REQUEST FOR CONTINUED EXAMINATION (RCE)- 2ND AND SUBSEQUENT REQUEST (SEE 37 CFR 1.114)	2000.00	1	2000.00
TOTAL AMOUNT:				\$2,420.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

#### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement

Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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Alexandria, Virginia 22313-1450  
www.uspto.gov

## ACKNOWLEDGEMENT OF LOSS OF ENTITLEMENT TO ENTITY STATUS DISCOUNT

APPLICATION #	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET #	REQUEST ID
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	177963

The entity status change request below filed through Patent Center on 03/07/2024 has been accepted.

### Certifications

APPLICANT CHANGING TO REGULAR UNDISCOUNTED FEE STATUS

### Signature

I certify, in accordance with 37 CFR 1.4(d)(4), that I am one of the signatories making the entity status change.

Signature	Name	Registration #
/Yangbeini Wang/	Yangbeini Wang	800005

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875				Application or Docket Number 17/181,057		Filing Date 02/22/2021		<input type="checkbox"/> To be Mailed		
ENTITY: <input checked="" type="checkbox"/> LARGE <input type="checkbox"/> SMALL <input type="checkbox"/> MICRO										
<b>APPLICATION AS FILED - PART I</b>										
		(Column 1)			(Column 2)					
FOR		NUMBER FILED			NUMBER EXTRA			RATE (\$)	FEE (\$)	
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A			N/A			N/A		
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A			N/A			N/A		
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A			N/A			N/A		
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *						x \$100 =		
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *						x \$480 =		
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL				
<b>APPLICATION AS AMENDED - PART II</b>										
		(Column 1)			(Column 2)			(Column 3)		
AMENDMENT	03/07/2024	CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR			PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0			x \$100 =	0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0			x \$480 =	0	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
								TOTAL ADD'L FEE	0	
		(Column 1)			(Column 2)			(Column 3)		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR			PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=			x \$0 =		
	Independent (37 CFR 1.16(h))	*	Minus	***	=			x \$0 =		
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
								TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.								SLIE		
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/MONIQUE BENJAMIN/		
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".										
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(b) and is being filed within three months of the date of filing of a national application other than a continued

- 2 -

Jonathan O'TOOLE  
Application No.: 17/181,057

prosecution application (CPA), OR within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

Document **US1** (10,195,321 B2) is submitted herewith as the English-language counterpart of document **FP2** (JP 2016508804 A).

Copies of documents **FP1-FP4** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

Atty. Dkt. No. 4944.0120006

- 3 -

Jonathan O'TOOLE  
Application No.: 17/181,057

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: March 26, 2024  
1101 K Street, NW  
10<sup>th</sup> Floor  
Washington, D.C. 20005  
202-371-2600

21575601.1

Atty. Dkt. No. 4944.0120006

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	of	3	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	001	US-10195321-B2	02-05-2019	TATTERFIELD et al.	
	002	US-10335525-B2	07-02-2019	FELBER; Armin et al.	
	003	US-11806454-B2	11-07-2023	DE BECDELIEVRE; Thibault et al.	
	004	US-20060106334-A1	05-18-2006	JORDAN; Alan, et al.	
	005	US-20080171970-A1	07-17-2008	LUZBETAK; Mark A. et al.	
	006	US-20120136325-A1	05-31-2012	ALLEN; Julie et al.	
	007	US-20160174728-A1	06-23-2016	KARP et al.	
	008	US-20160304004-A1	10-20-2016	SANDBOTHE et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	001	CN-109621041-A	04-16-2019	BINHAI CHANGZHENG ENTERPRISE MAN CO LTD [CN]		<input type="checkbox"/>
	002	JP-2016508804-A	03-24-2016	KONINKLIJKE PHILIPS N.V. [NL]		<input type="checkbox"/>
	003	WO-2018229504-A1	12-20-2018	CHIARO TECH LIMITED [GB]		<input type="checkbox"/>
	004	WO-9625187-A1	08-22-1996	MEDELA INC [US]		<input type="checkbox"/>

Examiner Signature		Date Considered	
-----------------------	--	--------------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	2	of	3	Attorney Docket Number	4944.0120006

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T <sup>2</sup>
		None	

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO

# **SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	17/181,057
Filing Date	02-22-2021
First Named Inventor	O'TOOLE; Jonathan
Art Unit	3783
Examiner Name	COURTNEY B FREDRICKSON
Attorney Docket Number	4944.0120006

Sheet	3	of	3
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## **CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

## **SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2024-03-26
Name/Print	Yangbeini Wang	Registration Number	800,005

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

### ENCLOSURES (Check all that apply)

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Fee Transmittal Form<br><input type="checkbox"/> Fee Attached<br><input type="checkbox"/> Amendment/Reply<br><input type="checkbox"/> After Final<br><input type="checkbox"/> Affidavits/declaration(s)<br><input type="checkbox"/> Extension of Time Request<br><input type="checkbox"/> Express Abandonment Request<br><input checked="" type="checkbox"/> Information Disclosure Statement<br><br><input type="checkbox"/> Certified Copy of Priority Document(s)<br><input type="checkbox"/> Reply to Missing Parts/<br>Incomplete Application<br><input type="checkbox"/> Reply to Missing Parts<br>under 37 CFR 1.52 or 1.53 | <input type="checkbox"/> Drawing(s)<br><input type="checkbox"/> Licensing-related Papers<br><br><input type="checkbox"/> Petition<br><input type="checkbox"/> Petition to Convert to a<br>Provisional Application<br><input type="checkbox"/> Power of Attorney, Revocation<br>Change of Correspondence Address<br><input type="checkbox"/> Terminal Disclaimer<br><input type="checkbox"/> Request for Refund<br><input type="checkbox"/> CD, Number of CD(s) _____<br><input type="checkbox"/> Landscape Table on CD | <input type="checkbox"/> After Allowance Communication to TC<br><br><input type="checkbox"/> Appeal Communication to Board<br>of Appeals and Interferences<br><br><input type="checkbox"/> Appeal Communication to TC<br>(Appeal Notice, Brief, Reply Brief)<br><input type="checkbox"/> Proprietary Information<br><input type="checkbox"/> Status Letter<br><input checked="" type="checkbox"/> Other Enclosure(s) (please identify<br>below):<br>Copies of FP1-FP4. |
|---|--|--|

#### Remarks

The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	March 26, 2024	Reg. No.	800,005

### CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature

Typed or printed name

Date

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**03/26/2024 05:04:13 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

### Title of Invention

BREAST PUMP SYSTEM

### Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 64835546

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED  
INVENTOR Jonathan O'TOOLECORRESPONDENCE  
ADDRESS -

AUTHORIZED BY Yangbeini Wang

### Documents

**TOTAL DOCUMENTS: 7**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024-03-26-Transmittal- Form-sIDS-4944- 0120006.pdf	1	Miscellaneous Incoming Letter	167 KB
2024-03-26-sIDS-Pleading- 4944-0120006.pdf	3	Letter specifying the conditions for filing under 37 CFR 1.97	99 KB
2024-03-26-sIDS-Form- SB08-4944-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	110 KB
Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
FOR_1_CN109621041A.pdf	41	Foreign Reference	855 KB
FOR_2_JP2016508804A.pdf	26	Foreign Reference	899 KB
FOR_3_WO9625187A1.pdf	29	Foreign Reference	635 KB

FOR\_4\_WO2018229504A1.pdf

198

Foreign Reference

2923 KB

**Digest****DOCUMENT****MESSAGE DIGEST(SHA-512)**

2024-03-26-Transmittal-Form-sIDS-4944-0120006.pdf

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FOR\_3\_WO9625187A1.pdf

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FOR\_4\_WO2018229504A1.pdf

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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security,

and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(b) and is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as

- 2 -

Jonathan O'TOOLE  
Application No.: 17/181,057

set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

Copies of documents **FP1-FP9** and **NPL1-NPL13** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018 in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
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Date: April 17, 2024

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Atty. Dkt. No. 4944.0120006



UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
www.uspto.gov

## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**04/17/2024 05:03:54 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

## Title of Invention

BREAST PUMP SYSTEM

## Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 65131167

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

## Documents

**TOTAL DOCUMENTS: 25**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024-04-17-Transmittal-Form-slDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	166 KB
2024-04-17-slDS-Pleading-4944-0120006.pdf	2	Letter specifying the conditions for filing under 37 CFR 1.97	99 KB
2024-04-17-slDS-SB08-4944-0120006.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	170 KB
Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
FOR_1_CN2452494Y.pdf	15	Foreign Reference	535 KB

FOR_2__EP3299043A1.pdf	25	Foreign Reference	282 KB
FOR_3__WO9000413A1.pdf	38	Foreign Reference	805 KB
FOR_4__WO02102437A2.pdf	61	Foreign Reference	1298 KB
FOR_5__WO2008137678A1.pdf	52	Foreign Reference	842 KB
FOR_6__WO2016014494A1.pdf	110	Foreign Reference	1380 KB
FOR_7__WO2017139437A1.pdf	77	Foreign Reference	1621 KB
FOR_8__WO2018054758A1.pdf	25	Foreign Reference	313 KB
FOR_9__WO2019080995A1.pdf	129	Foreign Reference	2315 KB
NPL_1__Rule 71-3-Amended-CI.pdf	4	Non Patent Literature	23 KB
NPL_2__AAP.pdf	5	Non Patent Literature	75 KB
NPL_3__Courage.pdf	17	Non Patent Literature	350 KB
NPL_4__GB201709566.2-Priority-document1.pdf	44	Non Patent Literature	1144 KB
NPL_5__GB201709564.7-Priority-document2.pdf	24	Non Patent Literature	287 KB
NPL_6__GB201709561.3-Priority-document3.pdf	24	Non Patent Literature	476 KB
NPL_7__GB201809036.5-Priority-document4.pdf	169	Non Patent Literature	2876 KB

NPL_8_Illinois-Nursing-Mothers-AcL.pdf	2	Non Patent Literature	45 KB
NPL_9_Silicone-Rubber-Complete-Guide.pdf	4	Non Patent Literature	130 KB
NPL_10_Rule71-3-Reply.pdf	1	Non Patent Literature	15 KB
NPL_11_British-Columbia.pdf	2	Non Patent Literature	29 KB
NPL_12_How-to-choose.pdf	8	Non Patent Literature	425 KB
NPL_13_Wyatt.pdf	6	Non Patent Literature	97 KB

## Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024-04-17-Transmittal-Form-sIDS-4944-0120006.pdf	5A7585C535166FA515819BDA7C3451F31BA729C91D8D6F8AF20CB08DDF43D2534B7CCB05B1E9F526F7839C9D0252C89BA1FA9A9CDEC282F5AC2D8F04FFCBBCA7
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FOR_4__WO02102437A2.pdf	CE2825089841355E044013CCA2F84FD3E053A4C2896307137F 8714295E1D7D2D3007BDC817983C42ACE46B9581D162753A4 CEC0A445DE88B24EFBCBED302B8C8
FOR_5__WO2008137678A1.pdf	F797128173E3B3AADB6101EDB6A07BED6F0BB8E8860116B0C 8BCE9BFC18BFA8137B061BCF959A3361BD4CA2B428634A866 16680BCEB395541C1AD52D89B65D8D
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FOR_7__WO2017139437A1.pdf	F141589AE380BB725ACC66AC3C6084B1C3A72C12BE789204A 74AC6BA7AB872F12BF8D408340C48A368239808E572D55ACF C5FD1D82D411A00DBACC2CDDD9775B
FOR_8__WO2018054758A1.pdf	305464A4CE93193C056C0456DF534801C6DE0E814ED879F22F 5F08ED2E7E97F226E5A6044163E231C3CDF40BD53C8F15F5A 6569224161F6B5B6C846D1FAED1E7
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NPL__6__GB201709561.3-Priority-document3.pdf	5F4D370B71FBD1765910D77733CAEB98EE5617791CA6CCBE E4F35B8EF9A528969E9C5947FCEF5EC8D693C04A3BD012E8 D13B2474CC0EF173C83364AB4C2E8906
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NPL__9__Silicone-Rubber-Complete-Guide.pdf	147B5B5869411B14CF839757A2C6B86C520A5D2F5E56CBD2B 2E3E896F9318BAA719BC7E70EEA8C96F60ACC5FFBC93377D 2C731EF59E866CB55DB16C5F216CF0E
NPL__10__Rule71-3-Reply.pdf	66C1262A1DEBB7FFD19937AFBFC6697850708B7D09011136B B98F2E3A5451204DFE7E65A37905133262F3067379751FC3436 FA9888D887D17D0B53F5ABE7BC42
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Substitute for form 1449/PTO

# **SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT**

## **Complete if Known**

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

Sheet 1 of 4

## **U. S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	US1	11,135 A	06-20-1854	Needham	
	US2	949,414 A	02-15-1910	Cunningham	
	US3	3,840,012 A	10-08-1974	Rushton, Jr.	
	US4	4,263,912 A	04-28-1981	Adams	
	US5	4,270,538 A	06-02-1981	Murphy	
	US6	4,772,262 A	09-20-1988	Grant et al.	
	US7	4,857,051 A	08-15-1989	Larsson	
	US8	4,929,229 A	05-29-1990	Larsson	
	US9	5,514,166 A	05-07-1996	Silver et al.	
	US10	5,571,084 A	11-05-1996	Palmer	
	US11	5,954,690 A	09-21-1999	Larsson	
	US12	6,379,327 B2	04-30-2002	Lundy	
	US13	2003/0191433 A1	10-09-2003	Prentiss	
	US14	6,652,484 B1	11-25-2003	Hunckler et al.	
	US15	2005/0154349 A1	07-14-2005	Renz et al.	
	US16	2006/0111664 A1	05-25-2006	Samson et al.	
	US17	7,223,255 B2	05-29-2007	Myers et al.	
	US18	7,559,915 B2	07-14-2009	Dao et al.	

## **FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP1	CN 2452494 Y	10-10-2001	XU JIANHUA		X
	FP2	EP 3299043 A1	03-28-2018	MEDELA HOLDING AG		X
	FP3	WO 1990000413 A1	01-25-1990	MEDELA INC		
	FP4	WO 2002102437 A2	12-27-2002	WHISPER WEAR INC		
	FP5	WO 2008137678 A1	11-13-2008	WHISPER WEAR INC		
	FP6	WO 2016014494 A1	01-28-2016	EXPLORAMED NC7 LLC		
	FP7	WO 2017139437 A1	08-17-2017	EXPLORAMED NC7 LLC		



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
Sheet	2	of	4	Attorney Docket Number	4944.0120006

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP8	WO 2018054758 A1	03-29-2018	MEDELA HOLDING AG		
	FP9	WO 2019080995 A1	05-02-2019	MEDELA HOLDING AG		X

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
	NPL1	Amended Claims in Response to Rule 71(3) (clean) regarding European Patent Application No. 18741597.1 to Positec Power Tools (Suzhou) Co. Ltd; dated February 20, 2024; 4 pages.	
	NPL2	Breastfeeding and the Use of Human Milk, American Academy of Pediatrics, Pediatrics, Vol. 100, No. 6, December 6, 1997; pp. 1035-1039.	
	NPL3	Courage, Katherine, "The Sucky History of the Breast Pump," Innovation, Smithsonian Magazine, September 12, 2022; 17 pages. Available at: <a href="https://www.smithsonianmag.com/innovation/sucky-history-of-the-breast-pump-180980653/">https://www.smithsonianmag.com/innovation/sucky-history-of-the-breast-pump-180980653/</a>	
	NPL4	GB 201709566.2 entitled 'Breast Pump' filed June 15, 2017; 44 pages (Priority Document 1).	
	NPL5	GB201709564.7 entitled 'A Liquid Level Measurement System' filed June 15, 2017; 24 pages (Priority Document 2).	
	NPL6	GB 201709561.3 entitled 'Bra Clip' filed June 15, 2017; 24 pages (Priority Document 3).	
	NPL7	GB 201809036.5 entitled 'Breast Pump System' filed June 1, 2018; 169 pages (Priority Document 4).	
	NPL8	Illinois Nursing Mothers in the Workplace Act, Illinois General Assembly, July 12, 2001; 2 pages. Available at: <a href="https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2429">https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2429</a>	
	NPL9	Omnexus, "Silicone Rubber: Complete Guide on Highly Durable Elastomer" 28.02.2024, [cited 28.02.2024] Available from: [ <a href="https://omnexus.specialchem.com/selection-guide/silicone-rubber-elasto">https://omnexus.specialchem.com/selection-guide/silicone-rubber-elasto</a> ]	
	NPL10	Reply to communication under Rule 71(3) regarding European Patent Application No. 18741597.1 to Positec Power Tools (Suzhou) Co. Ltd, dated February 20, 2024; 1 page.	



Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	3	of	4		

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published		T <sup>2</sup>
	NPL11	Sex Discrimination- Breastfeeding and Expressing Milk, British Columbia Human Rights Commission Policy and Procedure Manual, August 1, 2000; 2 pages. Available at: <a href="http://www.infactcanada.ca/br_bc_humanrights.htm">http://www.infactcanada.ca/br_bc_humanrights.htm</a>		
	NPL12	Women's Health Today, "How to Choose a Breast Pump" 08.11.2017, 8 pages; Available from: [ <a href="https://womenshealthtoday.blog/2017/11/08/how-to-choose-a-breast-pump/">https://womenshealthtoday.blog/2017/11/08/how-to-choose-a-breast-pump/</a> ] original file name: D2 How to Choose a Breast Pump_Womens Health Today.pdf		
	NPL13	Wyatt, Stephanie, MSN, APN, "Challenges of the Working Breastfeeding Mother, Workplace Solutions," AAOHN Journal, Vol. 50, No. 2, February 2022; pp. 61-66,		

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	4	of	4		

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.
- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2024-04-17
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Document Description: Transmittal Letter

PTO/SB/21 (07-09)

Approved for use through 12/31/2020. OMB 0651-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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**TRANSMITTAL  
FORM**

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	17/181,057
Filing Date	02/22/2021
First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

**ENCLOSURES (Check all that apply)**

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Fee Transmittal Form<br><input type="checkbox"/> Fee Attached<br><input type="checkbox"/> Amendment/Reply<br><input type="checkbox"/> After Final<br><input type="checkbox"/> Affidavits/declaration(s)<br><input type="checkbox"/> Extension of Time Request<br><input type="checkbox"/> Express Abandonment Request<br><input checked="" type="checkbox"/> Information Disclosure Statement<br><br><input type="checkbox"/> Certified Copy of Priority Document(s)<br><input type="checkbox"/> Reply to Missing Parts/<br>Incomplete Application<br><input type="checkbox"/> Reply to Missing Parts<br>under 37 CFR 1.52 or 1.53 | <input type="checkbox"/> Drawing(s)<br><input type="checkbox"/> Licensing-related Papers<br><br><input type="checkbox"/> Petition<br><input type="checkbox"/> Petition to Convert to a<br>Provisional Application<br><input type="checkbox"/> Power of Attorney, Revocation<br>Change of Correspondence Address<br><input type="checkbox"/> Terminal Disclaimer<br><input type="checkbox"/> Request for Refund<br><input type="checkbox"/> CD, Number of CD(s) _____<br><input type="checkbox"/> Landscape Table on CD | <input type="checkbox"/> After Allowance Communication to TC<br><br><input type="checkbox"/> Appeal Communication to Board<br>of Appeals and Interferences<br><br><input type="checkbox"/> Appeal Communication to TC<br>(Appeal Notice, Brief, Reply Brief)<br><input type="checkbox"/> Proprietary Information<br><input type="checkbox"/> Status Letter<br><input checked="" type="checkbox"/> Other Enclosure(s) (please identify<br>below):<br>Copies of FP1-FP9 and NPL1-NPL13. |
|---|--|---|

**Remarks**

The Office may charge any fee deficiency for any submission made with this transmittal to Deposit Account 19-0036.

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	April 17, 2024	Reg. No.	800,005

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Signature

Typed or printed name

Date

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Jonathan O'TOOLE

Confirmation No.: 4690

Applicant: CHIARO TECHNOLOGY  
LIMITED

Art Unit: 3783

Application No.: 17/181,057

Examiner: FREDRICKSON, COURTNEY B

Filing Date: February 22, 2021

Atty. Docket: 4944.0120006

Title: **BREAST PUMP SYSTEM**

**Supplemental Information Disclosure Statement**

*Mail Stop Amendment*

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(b) and is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as

- 2 -

CHIARO TECHNOLOGY LIMITED

Application No.: 17/181,057

set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

Copies of documents **FP1-FP3** and **NPL1** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patents and patent application publications cited on the attached IDS Forms are submitted.

It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/009,547, filed June 15, 2018, in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yangbeini Wang #800,005/

Yangbeini Wang  
Attorney for Applicant  
Registration No. 800,005

Date: June 26, 2024

1101 K Street, NW  
10<sup>th</sup> Floor  
Washington, D.C. 20005  
202-371-2600

22436971.1

Atty. Dkt. No. 4944.0120006

Document Description: Transmittal Letter

PTO/SB/21 (07-09)

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First Named Inventor	Jonathan O'TOOLE
Art Unit	3783
Examiner Name	FREDERICKSON, Courtney B
Attorney Docket Number	4944.0120006

**ENCLOSURES (Check all that apply)**

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Fee Transmittal Form<br><input type="checkbox"/> Fee Attached<br><input type="checkbox"/> Amendment/Reply<br><input type="checkbox"/> After Final<br><input type="checkbox"/> Affidavits/declaration(s)<br><input type="checkbox"/> Extension of Time Request<br><input type="checkbox"/> Express Abandonment Request<br><input checked="" type="checkbox"/> Information Disclosure Statement<br><br><input type="checkbox"/> Certified Copy of Priority Document(s)<br><input type="checkbox"/> Reply to Missing Parts/<br>Incomplete Application<br><input type="checkbox"/> Reply to Missing Parts<br>under 37 CFR 1.52 or 1.53 | <input type="checkbox"/> Drawing(s)<br><input type="checkbox"/> Licensing-related Papers<br><br><input type="checkbox"/> Petition<br><input type="checkbox"/> Petition to Convert to a<br>Provisional Application<br><input type="checkbox"/> Power of Attorney, Revocation<br>Change of Correspondence Address<br><input type="checkbox"/> Terminal Disclaimer<br><input type="checkbox"/> Request for Refund<br><input type="checkbox"/> CD, Number of CD(s) _____<br><input type="checkbox"/> Landscape Table on CD | <input type="checkbox"/> After Allowance Communication to TC<br><input type="checkbox"/> Appeal Communication to Board<br>of Appeals and Interferences<br><input type="checkbox"/> Appeal Communication to TC<br>(Appeal Notice, Brief, Reply Brief)<br><input type="checkbox"/> Proprietary Information<br><input type="checkbox"/> Status Letter<br><input checked="" type="checkbox"/> Other Enclosure(s) (please identify<br>below):<br>Copies of FP1-FP3 and NPL1. |
|---|--|---|

**Remarks**

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any over payment, to our Deposit Account No. 19-0036.

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

Firm Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.		
Signature	/Yangbeini Wang #800,005/		
Printed name	Yangbeini Wang		
Date	June 26, 2024	Reg. No.	800,005

**CERTIFICATE OF TRANSMISSION/MAILING**

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	FREDRICKSON, COURTNEY B
Sheet	1	of	3	Attorney Docket Number	4944.0120006

cU. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	001	US-6257070-B1	07-10-2001	GIALLORENZO; Mario et al.	
	002	US-7347089-B1	03-25-2008	KELLEY; Anthony R. et al.	
	003	US-20080255503-A1	10-16-2008	QUACKENBUSH; Carr Lane et al.	
	004	US-20120116299 A1	05-10-2012	TACK	
	005	US-20120277728 A1	11-01-2012	WEBER et al.	
	006	US-20150217033 A1	08-06-2015	POLLEN et al.	
	007	US-20210077673-A1	03-18-2021	MASON; Brian et al.	
	008	US-20230338630-A1	10-26-2023	CLAASSEN; Coen Petrus Martinus et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known)				
	001	EP-4000661-A1	05-25-2022	KONINKLIJKE PHILIPS NV [NL]		<input type="checkbox"/>
	002	WO-2005114113-A2	12-01-2005	ACCU GAUGE LTD [GB], et al.		<input type="checkbox"/>
	003	WO-2016186452-A1	11-24-2016	PARK CHO HEE [KR]		<input checked="" type="checkbox"/>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	FREDRICKSON, COURTNEY B
Sheet	2	of	3	Attorney Docket Number	4944.0120006

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author(in CAPITAL LETTERS),title of the article(when appropriate), title of the item (book,magazine,journal,serial,symposium,catalog,etc.),date,page(s),volume-issue number(s),publisher, city and/or country where published.	T <sup>2</sup>
	001	Declaration of Ryan Bauer In Support of Petition for Inter Partes Review of U.S. Patent No. 11,413,380, Exhibit 1005 in IPR2024-00953, May 31, 2024; 137 pages.	<input type="checkbox"/>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> Applicant is to place a check mark here if English language Translation is attached.



Substitute for form 1449/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	17/181,057
Filing Date	02-22-2021
First Named Inventor	O'TOOLE; Jonathan
Art Unit	3783
Examiner Name	FREDRICKSON, COURTNEY B
Attorney Docket Number	4944.0120006

Sheet	3	of	3
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**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2024-06-26
Name/Print	Yangbeini Wang	Registration Number	800,005

UNITED STATES  
PATENT AND TRADEMARK OFFICEP.O. Box 1450  
Alexandria, VA 22313 - 1450  
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## ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #  
**17/181,057**RECEIPT DATE / TIME  
**06/26/2024 02:44:37 PM Z ET**ATTORNEY DOCKET #  
**4944.0120006**

## Title of Invention

BREAST PUMP SYSTEM

## Application Information

APPLICATION TYPE Utility - Nonprovisional Application  
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4690

FILED BY Jon Baitlon

PATENT CENTER # 66125999

FILING DATE 02/22/2021

CUSTOMER # 26111

FIRST NAMED INVENTOR Jonathan O'TOOLE

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Yangbeini Wang

## Documents

**TOTAL DOCUMENTS: 7**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024-06-26-Transmittal-Form-sIDS-4944-0120006.pdf	1	Miscellaneous Incoming Letter	167 KB
2024-06-26-sIDS-Pleading-4944-0120006.pdf	2	Letter specifying the conditions for filing under 37 CFR 1.97	99 KB
2024-06-26-sIDS-SB08-0120006.pdf	3	Information Disclosure Statement (IDS) Form (SB08)	137 KB
Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
FOR_1_EP4000661A1_EFS.pdf	21	Foreign Reference	725 KB

FOR_3_WO2016186452A1__EFS.pdf	25	Foreign Reference	725 KB
NPL_1_Decl.-R.-Bauer.pdf	137	Non Patent Literature	1938 KB
FOR_2_WO2005114113A2.pdf	33	Foreign Reference	299 KB

## Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024-06-26-Transmittal-Form-sIDS-4944-0120006.pdf	578806E85771DA93B9413D5F1EBA87137899611822770AB0A00F9BC7A06E3864B6834C4CD715A5F145CA861E9AB79F40E1B6C8FD5BC918A18F7F5932413792B9
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FOR_3_WO2016186452A1_EFS.pdf	FA6A932E81BCE2A9BBD7DC914A2F9433AD61F68CB41DEC00F693E9A8C7CF1407BF7CE23A779753154C593FDCFFA822BAA84170DE2E3CC2B0A36031B87B023CB0
NPL_1_Decl.-R.-Bauer.pdf	1B07AD03FC623E2491245882C471749BC4B34C9FEDFEB985C0875DC79B8BEE486FE74810D52685837C31FD765F0DB624F7FF7409F5379467C4AD244C1E0ADBA5
FOR_2_WO2005114113A2.pdf	F205E8F44F90C29BB101F74C751CA75830F9AA503BF167F8310C04CD172A50EA7258EFAD29EDF240C9814C3F4AB22A1D7D

EE477860D19030713BB2364011456C

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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## NOTICE OF ALLOWANCE AND FEE(S) DUE

26111 7590 06/26/2024  
 STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.  
 1101 K Street, NW  
 10th Floor  
 WASHINGTON, DC 20005

EXAMINER

FREDRICKSON, COURTNEY B

ART UNIT

PAPER NUMBER

3783

DATE MAILED: 06/26/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690

TITLE OF INVENTION: BREAST PUMP SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/26/2024

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

**HOW TO REPLY TO THIS NOTICE:**

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at [www.uspto.gov/PatentMaintenanceFees](http://www.uspto.gov/PatentMaintenanceFees).**

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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26111 7590 06/26/2024  
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.  
1101 K Street, NW  
10th Floor  
WASHINGTON, DC 20005

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690

TITLE OF INVENTION: BREAST PUMP SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/26/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
FREDRICKSON, COURTNEY B	3783	604-067000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 \_\_\_\_\_  
2 \_\_\_\_\_  
3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. \_\_\_\_\_

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

**NOTE:** Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

**NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

**NOTE:** Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

**NOTE:** This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_



## UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/181,057	02/22/2021	Jonathan O'TOOLE	4944.0120006	4690
26111	7590	06/26/2024	EXAMINER	
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C. 1101 K Street, NW 10th Floor WASHINGTON, DC 20005			FREDRICKSON, COURTNEY B	
			ART UNIT	PAPER NUMBER
			3783	
DATE MAILED: 06/26/2024				

**Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)**  
 (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.



**OMB Clearance and PRA Burden Statement for PTOL-85 Part B**

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**Privacy Act Statement**

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.



<b>Notice of Allowability</b>	<b>Application No.</b> 17/181,057		<b>Applicant(s)</b> O'TOOLE et al.	
	<b>Examiner</b> COURTNEY FREDRICKSON		<b>Art Unit</b> 3783	<b>AIA (FITF) Status</b> Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12February2024.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are See Continuation Sheet. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to **PPHfeedback@uspto.gov**.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
**Certified copies:**  
a) ☒ All      b) ☐ Some\*      c) ☐ None of the:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
\* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. <input type="checkbox"/> Notice of References Cited (PTO-892) 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. <input type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. <input checked="" type="checkbox"/> Examiner's Amendment/Comment 6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 7. <input type="checkbox"/> Other _____.
---	---

/COURTNEY B FREDRICKSON/  
Primary Examiner, Art Unit 3783

Continuation Sheet (PTOL-37)

Application No. 17/181,057

Continuation of 3. The allowed claim(s) is/are: 1,3-22,24-25 and 28-34

Application/Control Number: 17/181,057  
Art Unit: 3783

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## DETAILED ACTION

### *Notice of Pre-AIA or AIA Status*

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### *Information Disclosure Statement*

The information disclosure statement (IDS) submitted is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

## EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

#### Amend **claim 6** as follows:

wherein the breast shield is configured to rotate smoothly around ~~[[a]]~~ the nipple inserted into the nipple tunnel to provide a correct positioning of the breast shield onto ~~[[a]]~~ the breast.

#### Amend **claim 7** as follows:

wherein the breast shield is configured to present, in use, a single continuous surface to ~~[[a]]~~ the nipple and ~~[[a]]~~ the breast.

#### Amend **claim 22** as follows:

wherein the housing is configured to be shaped to fit inside a bra by having an outer surface that is curved to fit contours of ~~[[a]]~~ the bra.

Application/Control Number: 17/181,057  
Art Unit: 3783

Page 3

Amend **claim 32** as follows:

the guide lines are configured to enable a user to visually inspect whether that breast shield is sized for ~~the~~ the nipple of the user when the nipple is placed in the nipple tunnel.

***Allowable Subject Matter***

**Claims 1, 3-22, 24, 25, and 28-34** are allowed over the prior art of record.

The following is an examiner's statement of reasons for allowance: The claims in this application are allowed because the prior art of record fails to disclose either singly or in combination the claimed breast pump device.

The closest prior art of record is Silver (20020198489).

**Regarding independent claim 1**, Silver fails to teach among all the limitations or render obvious guide lines that are configured to be aligned with the outside of the nipple when a correct nipple alignment is achieved and to visually define a correct spacing of the nipple from the side wall of the nipple tunnel, in combination with the total structure and function as claimed. Instead, Silver teaches longitudinal stiffening ribs (ribs 1160, 1164, 1166 in fig. 28) serve to reduce the tendency of the shield to expand or contract along its length (paragraph 202). There is no indication in Silver whether or not these ribs would be configured to visually define a correct spacing between the nipple and the sidewall of the nipple tunnel.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to COURTNEY FREDRICKSON whose telephone number is (571)270-7481. The examiner can normally be reached Monday-Friday (9 AM - 5 PM EST).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NATHAN PRICE can be reached on 571-270-5421. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/COURTNEY B FREDRICKSON/  
Primary Examiner, Art Unit 3783

<b><i>Index of Claims</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

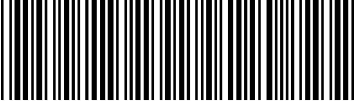
CLAIMS										
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	34		✓	✓	✓	=				

<b>Issue Classification</b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC						
Symbol					Type	Version
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/COURTNEY B FREDRICKSON/ Primary Examiner, Art Unit 3783	13 June 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

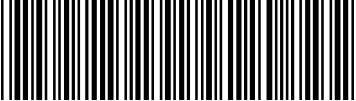


<b><i>Issue Classification</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

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NONE		<b>Total Claims Allowed:</b>	
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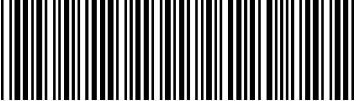
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	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783	

<b>INTERNATIONAL CLASSIFICATION</b>			
<b>CLAIMED</b>			
A61M	/	1	/ 06
<b>NON-CLAIMED</b>			
/		/	

<b>US ORIGINAL CLASSIFICATION</b>	
<b>CLASS</b>	<b>SUBCLASS</b>


<b>CROSS REFERENCES(S)</b>						
<b>CLASS</b>	<b>SUBCLASS (ONE SUBCLASS PER BLOCK)</b>					

NONE		<b>Total Claims Allowed:</b>	
(Assistant Examiner)	(Date)	30	
/COURTNEY B FREDRICKSON/ Primary Examiner, Art Unit 3783	13 June 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

<b><i>Issue Classification</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

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	9		18		27											

NONE		<b>Total Claims Allowed:</b>	
(Assistant Examiner)	(Date)	30	
/COURTNEY B FREDRICKSON/ Primary Examiner, Art Unit 3783	13 June 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

CPC - Searched*		
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a61m1/06-069	01/12/2022	cbf


CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see SEARCH history	01/12/2022	cbf
searched inventors in PALM and SEARCH	01/12/2022	cbf
consulted child search history	01/12/2022	cbf
Updated search history	10/17/2022	cbf
Updated search	03/24/2023	cbf
Updated search	10/06/2023	cbf
Updated search	06/13/2024	cbf

/COURTNEY B FREDRICKSON/ Examiner, Art Unit 3783	
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<b><i>Search Notes</i></b> 	<b>Application/Control No.</b> 17/181,057	<b>Applicant(s)/Patent Under Reexamination</b> O'TOOLE et al.
	<b>Examiner</b> COURTNEY FREDRICKSON	<b>Art Unit</b> 3783

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see SEARCH history	06/13/2024	cbf

/COURTNEY B FREDRICKSON/ Examiner, Art Unit 3783	
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Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
				Application Number	17/181,057
				Filing Date	02/22/2021
				First Named Inventor	Jonathan O'TOOLE
				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
Sheet	1	of	4	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	US1	11,135 A	06-20-1854	Needham	
	US2	949,414 A	02-15-1910	Cunningham	
	US3	3,840,012 A	10-08-1974	Rushton, Jr.	
	US4	4,263,912 A	04-28-1981	Adams	
	US5	4,270,538 A	06-02-1981	Murphy	
	US6	4,772,262 A	09-20-1988	Grant et al.	
	US7	4,857,051 A	08-15-1989	Larsson	
	US8	4,929,229 A	05-29-1990	Larsson	
	US9	5,514,166 A	05-07-1996	Silver et al.	
	US10	5,571,084 A	11-05-1996	Palmer	
	US11	5,954,690 A	09-21-1999	Larsson	
	US12	6,379,327 B2	04-30-2002	Lundy	
	US13	2003/0191433 A1	10-09-2003	Prentiss	
	US14	6,652,484 B1	11-25-2003	Hunckler et al.	
	US15	2005/0154349 A1	07-14-2005	Renz et al.	
	US16	2006/0111664 A1	05-25-2006	Samson et al.	
	US17	7,223,255 B2	05-29-2007	Myers et al.	
	US18	7,559,915 B2	07-14-2009	Dao et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP1	CN 2452494 Y	10-10-2001	XU JIANHUA		X
	FP2	EP 3299043 A1	03-28-2018	MEDELA HOLDING AG		X
	FP3	WO 1990000413 A1	01-25-1990	MEDELA INC		
	FP4	WO 2002102437 A2	12-27-2002	WHISPER WEAR INC		
	FP5	WO 2008137678 A1	11-13-2008	WHISPER WEAR INC		
	FP6	WO 2016014494 A1	01-28-2016	EXPLORAMED NC7 LLC		
	FP7	WO 2017139437 A1	08-17-2017	EXPLORAMED NC7 LLC		

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
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				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
Sheet	2	of	4	Attorney Docket Number	4944.0120006

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	FP8	WO 2018054758 A1	03-29-2018	MEDELA HOLDING AG		
	FP9	WO 2019080995 A1	05-02-2019	MEDELA HOLDING AG		X

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T <sup>2</sup>
	NPL1	Amended Claims in Response to Rule 71(3) (clean) regarding European Patent Application No. 18741597.1 to Positec Power Tools (Suzhou) Co. Ltd; dated February 20, 2024; 4 pages.	
	NPL2	Breastfeeding and the Use of Human Milk, American Academy of Pediatrics, Pediatrics, Vol. 100, No. 6, December 6, 1997; pp. 1035-1039.	
	NPL3	Courage, Katherine, "The Sucky History of the Breast Pump," Innovation, Smithsonian Magazine, September 12, 2022; 17 pages. Available at: <a href="https://www.smithsonianmag.com/innovation/sucky-history-of-the-breast-pump-180980653/">https://www.smithsonianmag.com/innovation/sucky-history-of-the-breast-pump-180980653/</a>	
	NPL4	GB 201709566.2 entitled 'Breast Pump' filed June 15, 2017; 44 pages (Priority Document 1).	
	NPL5	GB201709564.7 entitled 'A Liquid Level Measurement System' filed June 15, 2017; 24 pages (Priority Document 2).	
	NPL6	GB 201709561.3 entitled 'Bra Clip' filed June 15, 2017; 24 pages (Priority Document 3).	
	NPL7	GB 201809036.5 entitled 'Breast Pump System' filed June 1, 2018; 169 pages (Priority Document 4).	
	NPL8	Illinois Nursing Mothers in the Workplace Act, Illinois General Assembly, July 12, 2001; 2 pages. Available at: <a href="https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2429">https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2429</a>	
	NPL9	Omnexus, "Silicone Rubber: Complete Guide on Highly Durable Elastomer" 28.02.2024, [cited 28.02.2024] Available from: [ <a href="https://omnexus.specialchem.com/selection-guide/silicone-rubber-elasto">https://omnexus.specialchem.com/selection-guide/silicone-rubber-elasto</a> ]	
	NPL10	Reply to communication under Rule 71(3) regarding European Patent Application No. 18741597.1 to Positec Power Tools (Suzhou) Co. Ltd, dated February 20, 2024; 1 page.	

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>				<b>Complete if Known</b>	
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				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	3	of	4		

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published		T <sup>2</sup>
	NPL11	Sex Discrimination- Breastfeeding and Expressing Milk, British Columbia Human Rights Commission Policy and Procedure Manual, August 1, 2000; 2 pages. Available at: <a href="http://www.infactcanada.ca/br_bc_humanrights.htm">http://www.infactcanada.ca/br_bc_humanrights.htm</a>		
	NPL12	Women's Health Today, "How to Choose a Breast Pump" 08.11.2017, 8 pages; Available from: [https://womenshealthtoday.blog/2017/11/08/how-to-choose-a-breast-pump/] original file name: D2 How to Choose a Breast Pump_Womens Health Today.pdf		
	NPL13	Wyatt, Stephanie, MSN, APN, "Challenges of the Working Breastfeeding Mother, Workplace Solutions," AAOHN Journal, Vol. 50, No. 2, February 2022; pp. 61-66,		

/COURTNEY B FREDRICKSON/

06/13/2024

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<div>Substitute for form 1449/PTO</div> <div>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</div>				Complete if Known	
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				Art Unit	3783
				Examiner Name	FREDERICKSON, Courtney B
				Attorney Docket Number	4944.0120006
Sheet	4	of	4		

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).
- OR
- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).
- ☐ See attached certification statement.
- ☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2024-04-17
Name/Print	Yangbeini Wang	Registration Number	800,005

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Substitute for form 1449/PTO  <b>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)				Complete if Known	
				Application Number	17/181,057
				Filing Date	02-22-2021
				First Named Inventor	O'TOOLE; Jonathan
				Art Unit	3783
				Examiner Name	COURTNEY B FREDRICKSON
Sheet	1	of	3	Attorney Docket Number	4944.0120006

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
	001	US-10195321-B2	02-05-2019	TATTERFIELD et al.	
	002	US-10335525-B2	07-02-2019	FELBER; Armin et al.	
	003	US-11806454-B2	11-07-2023	DE BECDELIEVRE; Thibault et al.	
	004	US-20060106334-A1	05-18-2006	JORDAN; Alan, et al.	
	005	US-20080171970-A1	07-17-2008	LUZBETAK; Mark A. et al.	
	006	US-20120136325-A1	05-31-2012	ALLEN; Julie et al.	
	007	US-20160174728-A1	06-23-2016	KARP et al.	
	008	US-20160304004-A1	10-20-2016	SANDBOTHE et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
	001	CN-109621041-A	04-16-2019	BINHAI CHANGZHENG ENTERPRISE MAN CO LTD [CN]		<input type="checkbox"/>
	002	JP-2016508804-A	03-24-2016	KONINKLIJKE PHILIPS N.V. [NL]		<input type="checkbox"/>
	003	WO-2018229504-A1	12-20-2018	CHIARO TECH LIMITED [GB]		<input type="checkbox"/>
	004	WO-9625187-A1	08-22-1996	MEDELA INC [US]		<input type="checkbox"/>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.F./

<div>Substitute for form 1449/PTO</div> <div>SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT</div> <div>(Use as many sheets as necessary)</div>		Complete if Known			
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		Art Unit	3783		
		Examiner Name	COURTNEY B FREDRICKSON		
Sheet	2	of	3	Attorney Docket Number	4944.0120006

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		None	

Examiner Signature	/COURTNEY B FREDRICKSON/	Date Considered	06/13/2024
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> Applicant is to place a check mark here if English language Translation is attached.

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		Examiner Name	COURTNEY B FREDRICKSON		
Sheet	3	of	3	Attorney Docket Number	4944.0120006

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OR

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Yangbeini Wang #800,005/	Date (YYYY-MM-DD)	2024-03-26
Name/Print	Yangbeini Wang	Registration Number	800,005

**Bibliographic Data**

Application No: 17/181,057

Foreign Priority claimed: ☒ Yes ☐ No35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged:

/COURTNEY B  
FREDRICKSON/

Examiner's Signature

Initials

Title:

BREAST PUMP SYSTEM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/22/2021	604	3783	4944.0120006
<b>RULE</b>			

**APPLICANTS**

CHIARO TECHNOLOGY LIMITED, London, UNITED KINGDOM

**INVENTORS**

Jonathan O'TOOLE, London, UNITED KINGDOM

Adam ROLLO, London, UNITED KINGDOM

Andrew CARR, London, UNITED KINGDOM

**CONTINUING DATA**

This application is a CON of 16009547 06/15/2018 PAT 10926011

**FOREIGN APPLICATIONS**

UNITED KINGDOM GB1709566.2 06/15/2017

UNITED KINGDOM GB1709561.3 06/15/2017

UNITED KINGDOM GB1709564.7 06/15/2017

UNITED KINGDOM GB1809036.5 06/01/2018

**IF REQUIRED, FOREIGN LICENSE GRANTED\*\***

03/02/2021

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**ADDRESS**

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10th Floor

WASHINGTON, DC 20005

UNITED STATES

**FILING FEE RECEIVED**

\$1,540

## PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	17/181057.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:05 PM
L2	128	((("O'TOOLE") near3 ("Jonathan")) OR ("ROLLO") near3 ("Adam")) OR ("CARR") near3 ("Andrew"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/12/31 01:05 PM
L3	8470	a61m1/06-069.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L5	2	("20170216505").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:06 PM
L6	8	("20130023821" "20070219486" "20160296682").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/12/31 01:14 PM
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L8	2	("7824363").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2022/01/01 01:04 PM

L9	126	("10881766" OR "10926011" OR "20040087898" OR "20090281482" OR "20100292636" OR "20120165729" OR "20140263611" OR "20160228625" OR "20180110900" OR "20210196873" OR "20210196874" OR "20210196875" OR "20210196876" OR "20210205511" OR "20210205512" OR "20210205513" OR "20210205514" OR "20210205515" OR "20210205516" OR "20210205517" OR "20210205518" OR "20210228789" OR "20210268158" OR "7666162" OR "8608685" OR "20070135761" OR "20070179439" OR "20090281485" OR "20110009824" OR "20160271305" OR "20160296682" OR "20160325031" OR "20170095599" OR "20170112983" OR "20180028733" OR "20180333523" OR "5542921" OR "7833190" OR "10039871" OR "20020193731" OR "20040056641" OR "20040074281" OR "20040267215" OR "20050219302" OR "20060122575" OR "20070051172" OR "20070051727" OR "20080177224" OR "20080262420" OR "20080275386" OR "20110004154" OR "20110196291" OR "20110274566" OR	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2022/01/12 05:14 PM
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		"20120277636" OR "20130023821" OR "20140031744" OR "20140052056" OR "20140275857" OR "20140323962" OR "20140378895" OR "20150217036" OR "20150217037" OR "20150283311" OR "20160000980" OR "20160058928" OR "20160058929" OR "20160082165" OR "20160082166" OR "20160151551" OR "20160158424" OR "20160166745" OR "20160206794" OR "20160220743" OR "20160220745" OR "20160256617" OR "20160287767" OR "20160296681" OR "20160310650" OR "20170021068" OR "20170035951" OR "20170043065" OR "20170072117" OR "20170072118" OR "20170143879" OR "20170220753" OR "20180021490" OR "20180110906" OR "2849881" OR "4390024" OR "4535627" OR "5474683" OR "5941847" OR "5973770" OR "6045529" OR "6090065" OR "6227936" OR "6328709" OR "6358226" OR "6383163" OR "6440100" OR "6461324" OR "6547756" OR "6579258" OR "6663587" OR "6749582" OR "7048519" OR "7201735" OR "7312554" OR "7314400" OR "7662018" OR "7776008" OR					
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		"8057425" OR "8118772" OR "8187227" OR "8262606" OR "8282596" OR "8376986" OR "8702646" OR "8801495" OR "8876760" OR "8926556" OR "9033913" OR "9173587" OR "9345274" OR "9539377" OR "D548831").pn.					
L10	45	9 AND (transparent)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/12 06:05 PM
L11	105	3 AND (batter\$4) AND ((interface flange shield cup) WITH (clear transparent))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/13 02:07 PM
L12	382	3 AND (silicone WITH plastic)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 10:40 AM
L13	2	("20180333523").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 11:50 AM
L14	43	3 AND ((USB "universal service bus") WITH (charg\$4 recharg\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:19 PM
L15	2	("20160220743").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14

L16	5	("5542921").pn.	USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	12:42 PM
L20	256	3 AND ((shield cup interface flange) WITH (siz\$4) WITH different)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 12:52 PM
L21	2	("20120165729").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:23 PM
L22	2	("10881766").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 01:31 PM
L23	2	("10926011").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 02:23 PM
L24	12	("20080275386" "20140378895" "20130023821" "20180333523" "20160296682" "20070228059" "20120277636" "20160220743" "6227936"	(US-PGPUB; USPAT)	OR	ON	ON	2022/01/14 02:38 PM
							2022/01/14 03:55 PM

L25	267	"20090281485" "20120165729" "5542921").pn. 3 AND (nipple WITH (chang\$4 differ\$4 adjust\$4 dissimilar\$4) WITH (size width))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/17 03:06 PM
L26	2	"44148977".fmid.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; JPO)	OR	ON	ON	2022/10/17 03:31 PM
L27	1	("10926011").pn.	(USPAT)	OR	ON	ON	2022/10/19 04:47 PM
L28	11	("0000002" OR "10864306" OR "20050245860" OR "20070236584" OR "20080299517" OR "20120109083" OR "20140142501" OR "20160135998" OR "20180008758" OR "20180104396" OR "5406063").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/24 04:55 PM
L29	91	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (indicator line guid\$4 symbol indicia))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:26 PM
L30	17	3 AND (nipple WITH (siz\$4 spac\$4 dimension\$4) WITH (mark\$4 label))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:31 PM
L31	2	("20020198489").pn.	(US-PGPUB; USPAT;	OR	ON	ON	2023/03/24

			USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				05:34 PM
L32	19	(breast WITH shield) AND (size WITH label\$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/24 05:55 PM
L33	1	(09/888322).APP.	(USPAT; USOCR)	OR	ON	ON	2023/03/24 05:56 PM
L34	1	1 AND (correct WITH nipple WITH align\$6)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/06 02:29 PM
L35	9837	a61m1/06-0697.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/12 05:15 PM
L36	23049	breast WITH pump	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/12 05:16 PM
L37	61	(35 34) AND ((line indicat\$4 indicia icon signal signif\$6) WITH nipple WITH (placement align\$4 width siz\$4) WITH (proper\$4 correct\$4 appropriat\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/12 05:17 PM
L38	69	(35 36) AND ((line indicat\$4 indicia icon signal signif\$6) WITH nipple WITH (placement align\$4 width siz\$4) WITH (proper\$4	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO;	OR	ON	ON	2024/03/12 05:57 PM

L39	173	correct\$4 appropriat\$4)) (((("O'TOOLE") near3 ("Jonathan")) OR (("ROLLO") near3 ("Adam")) OR (("CARR") near3 ("Andrew"))).INV.	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2024/06/13 05:16 PM
L40	76	39 AND (line correct spac\$4).clm.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:16 PM
L41	42	39 AND (line correct spac\$4).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:16 PM
L42	0	("16713099").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:20 PM
L43	1	("6328709").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:22 PM
L44	2	("16/713099").app.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:23 PM
L45	1	("20160022477").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:28 PM
L46	376301	breast.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:33 PM
L47	7245334	pump\$4.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:33 PM
L48	1027289	shield.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:33 PM
L49	237305	interchang\$6.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2024/06/13 05:34 PM

L50	14008312	line.clm.	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:34 PM
L51	1017372	spacing.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:34 PM
L52	14008312	line.clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/06/13 05:34 PM

**PE2E SEARCH - Search History (Interference)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	76349	breast.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N2	480637	pump\$4.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N3	148822	shield.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N4	57138	interchang\$6.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N5	1665436	line.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N6	250019	spacing.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N7	1665436	line.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:34 PM
N8	0	N1 AND N2 AND N3 AND N4 AND N5 AND N6 AND N7	(US-PGPUB; USPAT)	OR	ON	ON	2024/06/13 05:35 PM